The Planters' Chronicle.

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THE U. P. A. S. I.

(INCORPORATED.)

The Scientific Officer.

On the 10th instant Mr. Anstead will proceed on a tour in the Anamalais, first visiting the Nilgiris in connection with the starting of an experimental plot for Coffee.

Mysore Dasara Industrial Exhibition.

Of the samples of Rubber displayed last August at the little exhibition held in connection with the Annual Meeting of the U. P. A. S. I. some were passed on to the Economic Botanist, Superintendent, Mysore Government Museum, and were included among the exhibits at the recent Mysore Dasara Industrial and Agricultural Exhibition. Three sets secured awards, as follows :—

Gold Medal.—Rani Rubber Co., for Pará and Ceará Rubber.
Silver Medal.—C. Lake, Munzarabad, for Rubber.
Bronze Medal.—Venture Estate, for Rubber.

These Medals, with the respective certificates, have been sent to the Secretary, U.P.A.S.I., who will be glad to hear from the winners as to their disposal.

Ashes from Bangalore Incinerator.

The Health Officer, C. & M. Station, Bangalore, having called attention to the ashes from the local incinerator as perhaps likely to be useful as a fertiliser, the Scientific Officer kindly undertook to make an analysis if a sample were submitted to him.

The following extract from his report will suffice to show the result of the investigation :—

" The Sample submitted to me consists, I understand, of the Ash from the Bangalore Incinerator, where refuse and rubbish of the town are destroyed.

" It is a dry and very finely divided powder, 92·7% of which passes a sieve with a 0·5 m.m. mesh, and 51·1% passes a sieve with a 0·25 m.m. mesh. The coarser particles are chiefly carbonaceous. It contains nearly 76% of insoluble matter, or sand, and this renders it useless for fertilising purposes as it would never pay to transport so much useless bulk over even a short distance, and it would not pay for application.

" The organic matter, about 5%, consists largely of carbonaceous matter, and the actual plant foods, Potash and Phosphoric Acid, are present in only small amounts.

" As the material is obviously unsuited as a fertiliser, it was not considered necessary to test the availability of these, or to determinate the Nitrogen present.

" The material can only be considered as a waste product, and it is quite useless for Agricultural purposes."

Scientific Officer's Papers.

LI.—Pads formed on Hevea Trees.

I have received a specimen of Hevea with a big pad of rubber formed on the tapped surface, and in view of the fact that similar pads beneath the bark of Hevea have attracted attention in Ceylon. I reproduce here what was written on the subject in the *Tropical Agriculturist* by Mr. Petch, the Ceylon Government Mycologist, in July and August 1909.

In the case under consideration the pricker had not been used, but the tapping coolies were supplied with pins with which to test the thickness of the bark, and beneath the pad was a pit evidently formed by the incision of the pin. The surrounding bark was densely permeated by a fungus mycelium and there were suggestions of the presence of canker.

Mr. Green, the Ceylon Government Entomologist, who kindly examined the specimen in the absence of Mr. Petch, says, "I am inclined to believe that it is due to irritation of the cambium, and pin pricks might well be an exciting cause. Deep seated fungus disease may, perhaps, produce the same result."

The use of pins for testing the thickness of the bark is, evidently, a practice which should not be adopted.

The following is Mr. Petch's account of the disease, alluded to above:—

"These facts bring us in conflict with another of those plausible phrases which have been promulgated and accepted without due consideration, *viz.*, 'incision, not excision.' In the case where the planter incises and injures the cambium, the tree immediately begins to excise very much more bark than was expected. Even when the cambium is not injured, the tree excises a small cylinder of bark immediately round the incision made by the pricker; these may fall out and leave the bark pitted, or they may remain *in situ* and constitute so many obstacles to the free flow of latex. It has been previously pointed out that if the planter "incises," the tree "excises" the tissues round the wound. In the old system of paring and pricking practically all the pricked bark was subsequently scaled off. Further it is known, that the renewal of bark after paring (*i.e.*, uniform excision) is satisfactory as far as regards the number and arrangement of its latex tubes, while on the other hand we have been warned that this is not the case after pricking (*i.e.*, incision and consequent local excision). The theory of "incision," not "excision," however admirable it may appear, fails therefore in practice.

"Through the courtesy of the Editor of the *Times of Ceylon*, I have received the two samples of bark referred to in that paper, on May 17th last. One of these was pricked six months previously and the other apparently more recently. Both show that even if the pricker does not actually penetrate to the cambium, its effect is felt there in that the cambium subsequently produces abnormal tissue, and the sample with six months' renewed bark completely confirms the result arrived at by Dr. Fitting, *i.e.*, that the renewed bark beneath the pricker-cut consists of stone cells without latex tubes. Now that the specimens are preserved in alcohol, this difference in structure is clearly indicated to the naked eye. For the tissue built up of stone cells is denser than the normal cortex, and therefore does not contract to such an extent as the latter when placed in alcohol. The tissue underneath each pricker-cut forms therefore a small elevation on the inner (cambial) side of the preserved cortex.

"Another phenomenon which has caused some alarm is the occurrence of pads of coagulated latex between the wood and the bark surrounding the pricker-cuts. In some cases this will be only an extension of the effect noted above, *i. e.*, the occurrence of black spots in the same situation. The explanations which have been furnished, however, are widely at

variance with the known structure and reactions of the Hevea tree. It may be laid down as a general rule, after four years' investigation of the subject, that when the bark decays owing to the attacks of fungi or from other causes, latex does not exude from the decayed tissue. The latex in the vessels is coagulated by the products of decay, or dries up because of the interruption of the water supply. Latex can only exude if the tissues are *suddenly* wounded. For example, the whole of the bark of a Hevea may be killed by *Corticium Javanicum* without the appearance of a single globule of rubber on or under the bark. But if any expansion or contraction occurs, either in the diseased tissue or the surrounding healthy bark, then the diseased tissue separates from the wood, and, as it does so, the fracture may extend along the cambium for a short distance into the surrounding healthy tissue, and consequently cause the flow of latex from the latter into the gap between the wood and the diseased bark. It has been claimed that a periodic contraction and expanison occurs daily in a Hevea stem, though the evidence in favour of the contention is scarcely satisfactory; but there is undoubtedly a difference in the tension of the bark cells in the morning and afternoon of a dry day, owing to the removal of water from the latex. This is shown by the greater percentage of rubber in the latex of afternoon tappings than of morning tappings. These differences in tension may be quite sufficient to produce the slight splitting required, though there may be other causes, *e. g.*, direct sunlight; and given the existence of black spots where the organic connection of bark and wood is destroyed, we have all the conditions necessary for the accumulation of pads of rubber underneath the bark. The point ignored in the explanations offered in the local press is that there must be a split between the bark and the wood before the latex can accumulate there. If, as is contended, the pricker-cut is closed by coagulated latex prematurely, then the latex would remain where it was before pricking, in the latex vessels. It is impossible that it should flow internally into the *solid* tissue."

"In the last number of the *Tropical Agriculturist*, it was stated that the death of the bark of Hevea, or at least its separation from the wood must precede the accumulation of rubber between the wood and the bark. Since that was written, I have received, per the Editor of the *Times* and Mr. C. Northway, two specimens showing these rubber pads; they were described by Mr. Northway in the local papers on June 8th. Each specimen consists of a strip of bark, 10 centimetres broad, (*i.e.*, horizontally round the tree), and 6 centimetres high. The thickness of the bark, after several days' drying in transit, is three to four millimetres, (*i.e.*, three-twenty-fifths of an inch); it would be thicker when fresh. The trees had been scraped some considerable time before pricking, since each piece shows a well developed outer brown layer, one-fiftieth of an inch thick, scaling off, and a further thickness of one-twenty-fifth of an inch turning brown; so that half the total thickness of the bark is already corking off as a consequence of the scraping. This uniform scaling off has nothing to do with the formation of the rubber pads. Specimen A has, in the middle, a patch of dead bark, (*i.e.*, dead right through to the cambium) about 5 centimetres in diameter, with a pad of rubber of the same size behind it; it forms a blister raised about 6 millimetres above the surrounding level; there are two lines of pricker-cuts across the specimen; one of these just touches the edge of the rubber pad. The other passes over the pad at a distance of one centimetre from its edge; the outer surface of the pad is marked with incisions of the pricker, and fragments of bark have been pushed into it, while the inner surface bears corresponding projecting teeth of rubber which have been pushed out by the pricker; the pieces of bark within the

pad and the marks of the pricker on both surfaces prove conclusively that the *pad was formed before the bark was pricked*. Specimen B is similar; the blister in this case measures 8 centimetres by 5 centimetres, and the rubber pad is one centimetre thick; there are three lines of pricker cuts, of which the upper and lower just touch the edges of the pad, while the middle line goes right across it, but, in consequence of its thickness the pricker cuts do not penetrate completely through it; as before, the dead bark has been driven by the pricker into the pad, and this shows that the pad was formed before the bark was pricked. The bark round the blister, which was living when pricked, shows only the pricker cuts through it. In specimen B, a new bark is growing under the edge of the pad at one side, and as this new bark is 6 millimetres broad, the pad must have been in existence for some time.

"Further light is thrown on this phenomenon by another specimen which has been sent in, showing the death of the bark in patches after scraping. In this case it was detected at once, and there had been no time for its separation from the wood and the consequent formation of a rubber pad. Normal Hevea bark is protected from injury by its outer brown dead layer. When this layer is scraped off, the inner tender living tissues are exposed and they immediately begin to die back. As a rule, they die back uniformly and form another continuous outer brown layer, but in some cases a patch of bark two or three inches in diameter dies right down to the cambium. When this dead patch splits away from the wood, rubber pads are formed by the inflow of latex from the surrounding healthy bark. There seems to be no explanation, other than exposure to sunlight, etc., for the production of these patches of dead bark. I have not been able to find any fungus in them, through there is a well known semi-parasitic fungus of Hevea which might be expected to produce such a result. The fact that the dead bark is strictly limited, *i.e.*, that the effect does not spread continuously, argues against any fungus tagency.

"The facts detailed above support the statements that (*a*) the rubber pads can form independently of the use of the pricker, (*b*) the bark dies in patches in consequence of scraping, (*c*) the rubber pad is formed after, not before, the death of the bark."

RUDOLPH D. ANSTEAD,
Planting Expert.

ERRATUM.

In issue of December 31, 1910, the Scientific Officer's Paper—"Tour in South Mysore"—was erroneously numbered "xl." The heading and the entry in the list of Contents should both have been

L—Tour in South Mysore

Paper *li* appears in the present issue.

With the vast increase in the world's demand for rubber, and the rise in price of this product, considerable attention has been given to rubber cultivation in the Philippines. Exhaustive experiments have been made by the Bureau of Agriculture and by private persons with, on the whole, very satisfactory results. Extensive planting has taken place in the province of Bataan, which forms the western wall of Manila Bay, and in the Islands of Mindanao and Basilan in the south of the Archipelago. These trees are not yet old enough to produce rubber, but it is hoped that in time the United States market will receive a large proportion of its supply from the islands.

Notes and Comments by the Scientific Officer.

90. *Poonacs.*—The point has been raised by a correspondent whether it would not be better to apply ½ lb. per tree of a cheaper poonac instead of ¼ lb per tree of one containing more Nitrogen.

This is largely a matter of cost of transport and application. It costs just as much to mix, bag, and handle, a ton of a low grade poonac as it does a ton of high grade poonac, and the cost of applying half a pound per tree is a little more than that of applying ¼ pound per tree, though very little more.

As a rule plant food can be bought more cheaply in a concentrated form than in a low grade form because of the cost of tranport on the useless bulk, and from this point of view every pound of material in the fertiliser which is not plant food adds to the price. However, if transport is reasonable there can be no mistake made in buying low grade fertilisers so long as the price is carefully compared with the guarantee.

In the case of Poonac, Ground Nut Poonac contains about 7% of Nitrogen and costs about Rs.86 per ton, while a low grade Poonac like Hoongay contains about 4% of Nitrogen and costs about Rs.50-8-0 per ton. In the former 1 lb. of Nitrogen costs 8 annas 9 pies, in the latter 9 annas so that the low grade form is the more expensive. The cost per tree for the former is 1·84 pies and of the latter 2·2 pies, again more expensive. Thus it is that usually the more concentrated the fertiliser, and hence the higher the price, the cheaper it is.

The comparative cost, taking transport and application into account, must be worked out since all depends on this. As far as the soil is concerned it does not matter whether ¼ pound per tree of a poonac containing 8% of Nitrogen is applied or ½ lb. per tree of a poonac containing 4% of Nitrogen. The latter will have a slight advantage in that it will supply more organic matter, that is humus making material.

91. *Nodules on the Roots of Leguminous Plants.*—When the roots of Leguminous plants are examined for nodules great differences will be noticed in the numbers occurring on the different species. *Sesbanias* and some of the *Crotalarias* will be found to have great masses of nodules on their roots. while plants like *Cassia Tora*, for instance, have hardly any at all. This difference is discussed in Circular No. 70 of the Bureau of Plant Industry of the United States Department of Agriculture, where it is stated that, "in some cases no nodules were found to some individuals, but this was probably due to the difficulty in removing roots from the soil, rather than to lack of nodules."

Another interesting point is discussed in this Circular, and that is the difference between annuals and perennials as regards their possession of nodules. "In general there seem to be many more nodules on annuals, in proportion to the size of the roots, than on perennials. As to the relative quantities of Nitrogen gathered by annuals and perennials no data have yet been obtained. Some co-operative work on these lines has been begun, but it has not gone far enough for a report."

92. *Iron Slag as a Fertiliser.*—A sample described as 'the slag of Iron and Steel available at local carpenters' works' has been recently examined in the Laboratory to see if it was of any value as a fertiliser. It proved to be very insoluble, and contained 67·4% of insoluble matter, 17·5% of Iron Oxide, and only 0·66% of Phosphoric Acid, so that it is of no value whatever as a fertiliser.

RUDOLPH D. ANSTEAD,
Planting Expert.

RUBBER.

Salt as a Fertiliser.

The *Times of Ceylon* published the following recently :—

An Avisawella correspondent, who revives tbe question of the value of common salt as a fertiliser in rubber cultivation, has written us as follows :—

" I shall be glad to know whether any of your readers can give me any information as to the use of common rock salt for rubber cultivation—whether they have tried it, and with what results. According to a Government circular issued in the F.M.S., they say that salt is largely used for cultivation in rubber, and as no duty is charged, and the salt is very abundant, it provides a cheap and valuable fertiliser. If this is so, and the results good, surely it would pay to bring it to Ceylon, and, probably, Government would reduce the import tax providing it was used for this purpose."

" We sought the opinion of Mr. P. A. Keiller, F.C.S., Analytical Chemist to the Colombo Commercial Company, on the subject, and that gentleman expressed some doubt on hearing that salt was used to any extent for this purpose in the F. M. S. It had an action, he said, in liberating potash from the soil in rather the same way that lime acted, but it was not a direct plant-food, and it was only effective when the crop required more potash than the soil could normally furnish. Whilst it was an indirect fertilizer, it did not supply any direct manure to the soil-

" Our representative pointed out that if the tax were removed or reduced on salt used for manuring purposes, possibly something would have to be done to it in order to make it unpalatable, or otherwise it might be put to an improper use.

'Could it be chemically treated so that while its fertilizing powers remained it would be useless for domestic use.'

' Oh, certainly ! You can mix it with kainit which would make it unpalatable while adding to its fertilizing power ; or lime or gypsum could be added.'

' Would the cost be made very much greater by mixing it with kainit ?'

' I don't think so. Kainit is the cheapest potash salt and costs about R60 a ton. But I would not recommend the use of salt in rubber cultivation. I doubt whether it is within the range of practical politics.'

OTHER OPINIONS.

Mr. Reinhart Freudenberg and Mr. Martin Hohl, the firm's expert, agree almost entirely with the opinion expressed by Mr. Keiller, while emphasising the usefulness of salt in connection with cocoanut planting. Mr. Hohl failed to see what advantage would be gained by using salt, seeing that kainit was not only less expensive, but contained potash and magnesia, and, unlike salt, had no single impurity. Kainit possessed from 12 to 16 per cent. of potash, from 12 to 14 per cent. of magnesia, and about 35 of common salt, and the purchaser obtained the salt free, paying only for the magnesia and potash.

[*Note by the Scientific Officer.*—When a soil contains Zeolite, which is a hydrated silicate of alumina and alkalis, or alkaline earths, this Zeolite will react with any soluble salt of sodium, potassium, calcium, or magnesium, setting Potash free to become available for the plant. This explains the action of Salt on a clay soil containing Zeolites, and its manurial action is entirely indirect.

The application of Salt, however, to Rubber is not advisable, and with any crop it must be used with care, as its effects on most plants are deleterious rather than beneficial. A few special plants, like Cocoanuts, thrive on it, but the majority do not. The deleterious effects appear to be probably

due to the Chlorine in the Salt. Salt also possesses the power of deflocculating Clay, and so on heavy soils injures the tilth, rendering them sticky and wet.—R. D. A.]

Castilloa Rubber in Mexico.

One or two planters who are growing *Castilloa elastica* in South India have made requests, from time to time, for information regarding methods of cultivation, tapping, &c. There has not been very much information of this kind available hitherto, but the following extracts from a paper on Rubber in Mexico, contributed by Dr. Pehr Olsson-Seffer to *The American Review of Tropical Agriculture* will probably interest many planters in this country.

Inter alia Dr. Olsson-Seffer writes :—

In regard to soil requirements *Castilla* needs an open porous soil, well drained, but with sufficient underground water supply. The chemical consistency of the soil or its relative richness is of little importance. Stagnant water or very acid soil is detrimental, and thin soil with hard impermeable sub-soil will grow *Castilla* for a few years, but when the tree reaches six or seven years of age, and the roots penetrate deeper and reach water, growth ceases and the tree is liable to die back.

I have made analyses of numerous samples of rubber soils from the Zacualpa district, and in one instance I analysed chemically and physically a series of samples from the surface to a depth of 22 feet. This was a section of the soil on La Zacualpa, or on the alluvial flats of the district. Although the soil was not unusually rich chemically, its physical condition was as nearly perfect as possible. The entire section showed no stratification of the soil, that is to say, it was of uniform character to the depth indicated, where the permanent water level was found. On account of this condition of soil the water was rising by capillary attraction to the surface, and the advantage of this during the six months' dry season of the district is evident.

On the other hand, I consider that the distinct and comparatively long dry season of the Pacific coast is a decided advantage for rubber culture. I will explain this by briefly giving my views regarding the function of the latex in *Castilla*. There are many different views on this question, but I believe the evidence collected during the work at La Zacualpa will prove conclusive, and I expect to publish this in another place.

One claim is that the principal function of latex is protection against the natural enemies of the tree. It is supposed that latex has developed simply for the purpose of preventing boring insects from penetrating into the live tree. It has been observed that certain insects in trying to penetrate the bark get their mouths, organs filled with the sticky latex and thus are prevented from continuing. This may be true in a few instánces, but on the other hand, some individual trees of *Castilla* do not produce latex, and are still able lo survive. They are, in fact, as little attacked as those with latex.

Another claim is that the latex has been developed as a means of storing plant food. This explanation of the function of latex is more natural but even this is not entirely correct, Nor is it true that the latex serves for the purpose of storing water or preventing a too rapid transpiration only. A careful study of plant life and of the physiological functions of the various organs of a plant shows that very few if any organs or parts serve for one purpose only. Generally nature has provided for complex functions for the various organs. So also in regard to the latex. There can be no doubt but that the latex at certain times forms a protection for the plant, not only by preventing insects from attacking the vital parts of the plant,

but also by covering any wound accidentally made. It is also proved that the latex contains a large amount of store drop food within the plant. Whether and to what extent the rubber tree can draw upon this store is as yet unknown. One of the primary functions, however, of latex is that of preventing a too rapid transpiration. For this reason we find that the rubber trees growing in a region with a distinct dry season develop a larger amount of latex as a provision against the drought of that period.

This will explain why *Castilla* in the Zacualpa district, for instance, produces a large amount of latex, while at the same time the flow of latex in this part of the country is more copious than in most other regions. This depends upon the fact mentioned above that on account of the condition of the soil water is always available for the roots, and the turgid state of the cellular tissues so necessary for the exudation of latex is maintained.

Rubber planters in Mexico and Central America have been experimenting regarding cultural methods for a good many years, and it is only of late definite results have been forthcoming. In many special questions no ultimate conclusions have yet been arrived at, and we cannot say that we are absolutely certain as to the best methods in any particular stage of the cultivation or preparation of *Castilla* rubber.

The question of shade in *Castilla* culture has been much debated. In Mexico there are still three different methods in vogue. The first that was used in the early days of rubber culture was to plant in shade. It is based on an erroneous observation of nature. *Castilla* was found in the forests, and as it is a comparatively low tree, it was supposed that it required shade for its successful growth. It was also found that if the seeds were sown in the open without any shade, the young seedlings often failed, or if they survived the first dry season they grew very slowly. On the other hand, seeds germinated very freely when sown in shade, and the seedlings grew rapidly, especially in height. The observant planter soon discovered, however, that the first year's growth was not continued, and as years went by found that grown *Castilla* developed into fishing rods without any increment in trunk growth. Moreover, the trees were sickly, often attacked by root fungi, and generally very liable to disease. There are still some planters who persist in keeping shade, enjoying the sight of 40 to 50 feet high whiplike trees, six to seven years old, but which never will reach a "tapable" size.

The second system as regards shading is to plant in semi-shade, that is, to leave a few high trees when clearing, expecting these to give the rubber trees a certain amount of shelter in the dry season, when the *Castilla* has shed its leaves and is exposed to the scorching sun. This method has been employed with a certain amount of success on some plantations, especially where the soil is liable to become hard and baked if exposed to the sun. It seems the most natural, as *Castilla* in its wild state always occurs in the vicinity of other trees from which it receives shelter and shade. To establish such conditions it is not, however, necessary to leave jungle trees as shade, but by planting close the commensalism needed will be obtained. This can be easily overdone, and the planter has to exert considerable judgment in regard to the distance at which he should plant. In localities where the soil is very moist or drainage imperfect any shade whatsoever may prove dangerous to the health of the rubber, and it certainly will greatly retard the proper development of the stand.

The third method is to plant in the open. If the seeds are sown at an unsuitable time, that is, if the soil is not moist or if no rain follows for weeks, complete failure in germinating may result. If the district has a distinct

dry season, the seedlings will suffer greatly during that time, in case they have not had a good growth before the rains were over. Otherwise there are no objections to planting in the open, and if this has been done fairly close, so that the young plants partly shade each other, they have under these conditions the best opportunities of a rapid development.

Another important question in regard to rubber planting is that of distance between the trees. Considerable difference of opinion exists in this respect, and as in the case with *Hevea* planters, distances varying from six by six feet to thirty by thirty feet have their advocates among planters of *Castilla.*

I have concluded from experiments conducted with a view toward ascertaining the relation of distance between the trees and the weekly, monthly and annual increment of trunk growth, that as soon as the roots of the trees touch and become intermatted the growth of the trees is impired. But on the other hand, we know that if the *Castilla* trees are planted very far apart their growth is stunted, and, when the trees become older, their bark is exposed to the heat of the sun and to evaporation caused by dry winds passing through the plantation. The result of this is that the bark cracks, the latex vessels shrivels, and no latex can be obtained. We then say that the trees are "sunburned."

(*To be Continued*).

Mexican Castilloa.

Writing in *d'Agriculture Tropicale*, M. M. B. Luis states that two large companies have made Castilloa rubber production the basis of their business, with rather disastrous results. The site of their operations was in the Isthmus of Tehuantepec, and M. Luis says that there are now enormous quantities of Castilloa trees from six to twelve years of age, which, on account of the climate, are never like to prove profitable (further south in the Province of Chiapas, where the dry season does not last five months as on the Isthmus, the Castilloa grows well, and gives better results). The American Companies, wkich had promised fabulous dividends to their shareholders, have been unable to make good and are within measurable distance of bankruptcy, principally owing to the slow growth of the trees, but in many cases the managers have shown a great lack of knowledge of the country, and rubber cultivation generally—bad tapping has killed hundreds of trees.

The managers of the existing properties are agreed that Castilloa gives the best returns when spontaneous vegetation yields some shelter (shade) to the base of the trunk. But in any case it will be impossible to speak positively of the prospects of Castilloa in the Isthmus for five or six years yet.

In British Guiana.

The Report of the Comptroller of Customs at Georgetown on the Customs Revenue, Trade and Shipping of British Guiana in the year ended 31st March 1910, states that experimental rubber stations were established by the Government some little time ago with a view of obtaining experience in regard to the class or classes of rubber trees which would yield the best results under certain conditions ; and the experiments are still being proceeded with. Numerous tracts in British Guiana are regarded as being suitable for the cultivation of rubber, and it is stated that if proper tracts of land are taken up and developed intelligently there seems to be no reason why the rubber industry should not in the course of the next decade assume much larger proportions than it has at present.

PEPPER.

Extracts from Scientific Report of the Taliparamba Agricultural Station, for 1909-1910.

The Taliparamba Agricultural Station is situated in north Malabar about 6 miles from the sea coast and was established with a view to studying the cultivation of pepper.

2. An account of the locality and the local agriculture will be found in the Scientific Report of 1908-1909.

3. *The Season* this year has, though abnormal, been very favourable to the bearing of pepper. To all intents and purposes, as far as the pepper crop was concerned, the season commenced a month earlier than usual, and the heavy rains during the north-east monsoon season did much to prevent the shedding of pepper subsequently. Thus instead of a rainy season of 4 months this year it extended over 7 months with occasional breaks of fine weather. This favoured all the conditions which have been presumed to be most suitable to the setting of pepper, namely, heavy rain with broken periods of fine weather; and the opinion that these conditions are favourable both to the flowering and setting, was endorsed by the high yields obtained this year and by the fact that ripening was not at all uniform. Some pepper was quite young when other was ripe, showing that the pepper had more than one opportunity to flower and set.

4. The rainfall can be summarised as follows:—Hot weather rains 31·91 inches (average of preceding 4 years 5·27 inches); south-west monsoon rains 119·48 (average of preceding 4 years 121·18 inches); north-east monsoon rain 19·55 inches (average of preceding 4 years 11·04); from November 30th to March 31st, 00·54 (average of preceding 4 years 1·60.

[Further details of the rainfall are given in an appendix to the report].

[The total yield of green pepper in Madras measures in the different blocks for the last five years is shown in a Table.] From this it will be seen that since 1907, the yield under ordinary treatment has risen from 927 Madras measures to 3,630 Madras measures in 1910, an increase of 291 per cent., and that the number of vines in bearing has increased from 2,412 to 3,431, or 42 per cent. The experimental plots have *in toto* shown a much greater increase, viz., from 170·75 Madras measures in 1907 to 1,119 Madras measures in 1910, or 555 per cent., and the number of vines in bearing has increased from 749 to 1,241, or 66 per cent. [The yields of the several plots under experiment is shown in a Table.] These figures however can give little more than a general idea of the improvement, as even the average of a large number of plots in one block give, when comparing one block with another, such great variations in yield. In the pepper gardens of the Agricultural Station, it is impossible to get anything approaching uniformity of conditions. Gradient and drainage, aspect and shade, the variety of pepper and the effect of the season on its bearing powers, vary from plot to plot. Nearly the whole of block II, for instance, consists of the Utherancotta variety, a female vine, which only gives a good crop in very favourable years, such as 1906 and 1910. Thus in 1907 the yields were exceptionally low; the gardens before being acquired had been neglected and almost abandoned and the vines could not recover all at once from the effects of bearing too heavily in 1906. In 1908 there is seemingly a sudden increase both in yield and in the number of vines bearing. In 1909 there is a still further slight increase and in 1910, a favourable year for even the worst vines, another sudden rise in yield. Block I, on the other hand, contains comparatively little Utherancotta. The more exposed plots containing chiefly Kalluvalli, and the cooler and moisture plots a mixture of Balamcotta and Kalluvalli—both good varieties, which, not having a complete rest

for several successive seasons, do not respond to a favourable season quite so readily as Utherancotta. Block III contains two or three plots which are purely Utherancotta and others which are practically pure Kallvalli, while a few of the moister and cooler plants are mainly Balamcotta. Kalluvalli has the reputation of bearing a good crop only every other year, and the successive yields of the whole block seem to show that there is some truth in this.

5. [Details of the yields from plots under special treatment are given in the report in tabular form. These are discussed below.]

GREEN MANURE PLOTS.

Kolingi (*Tephrosia purpurea*).—This has shown no improvement, probably owing to the poor stand and subsequent growth of the green manure crop which seems unable to stand the comparatively heavy shade of the pepper garden.

Groundnut, when first tried, was sown after the monsoon, but in the last year this has been sown in May. This makes very fair growth, though not to be compared with that in the open. The leaves are much smaller and the plants are much drawn up by the shade. It has moreover to be sown every year. The cost of green-manuring comes to about Rs.6 per acre.

Horsegram makes very fair growth. It has, however, only been tried this last year. It is too soon to state how much of the increased yield is due to this.

Cassia tora.—This has not made good growth. The plants are stunted. The increase in the plot yield is probably due to the more thorough digging necessary when green manure has to be sown and to the 1910 season being favourable to Utherancotta.

Sunnhemp.—This plot has shown considerable improvement. The sunnhemp makes only fair growth. How far the improvement is due to the sunnhemp and how far to the extra digging, it is impossible to say. The improvement is not apparent from the yield statement but only from the condition of the vines in the plot.

MANURES.

Ashes—Though the yield has shown an appreciable increase the vines do not seem altogether healthy. This may be due to (1) over bearing, (2) the removal of heavy top shade in 1909, and (3) want of a nitrogenous ingredient in the manure.

Fish manure.—This plot adjoins the above and has shown steady impaovement in spite of the removal of heavy top shade in 1909. The vines are strong and show no signs of over-bearing.

Lime and leaf mould.—This has had a very marked effect on the vines. The plot is, in part, low-lying and badly drained while it is much exposed to the sun in the hot weather. So miserable, in fact, did the plot appear in 1906-1907 that it was hardly thought worth while to continue cultivation in it. The lime and leaf mould was applied as a last resource. Even in 1907-1908, the first year in which this dressing was applied, a marked improvement was noticed which has since been maintained.

Cattle manure.—Has not shown any marked improvement in the condition of the vines though it can be said that their condition has not gone back as it has done in the majority of the plots in this block. The majority of the vines are Utherancotta, which, as they fall, are being replaced by better varities. The manure has not had a proper trial.

Gingelly oil cake.—The same remarks apply to this as the above.

Leaf mould.—This has improved the vines considerably more so than appears from the yields. The variety is mainly Kalluvalli ; hence the low

yield in 1909. In 1910 many of the young vines planted from 1907 commenced to bear and thus reduced the plant-war yield.

METHODS.

Mounding.—This is a common practice in the Wynaad and also in South Malabar. The vines in this plot show great improvement, more so than the yields would show. The plants also stand the hot weather well. Several of the young vines commenced to bear this year, which reduced the plant-war yield.

Leaf mulching.—The whole plot is mulched with leaves at the end of the monsoon. The vines can thus withstand the hot weather better. The plot is, on the whole, doing well, though difficulty is found in establishing young vines in the plot.

6. *Selection of vines for propagation.*—Since the station has been started, each year, at harvest time, the best bearing vines in each plot are harvested separately with a view to selecting the best strain of vines for propagation. Some excellent vines have in this way been selected.

7. *General.*—The general condition of the pepper gardens have greatly improved. A few plots have been attacked with a disease known as "pollu" in which the green berry is bored by the larva of a small flea beetle. On the farm the injury is only trifling, though outside it is reported to be very severe, especially in cool moist gardens which do not receive their annual digging. The Madras Mycologist (then acting Imperial Mycologist) visited the station and took specimens of diseased vines, but whether this is the Wynaad pepper vine disease still, I understand, remains to be worked out.

TEA IN THE PERSIAN GULF.

In his report on the Trade of the Consular District of Bushire for the year 1909-10 Mr. N. Worrall remarks :—

The legitimate import of tea has shrunk from £69,654 to £38,609 (280 tons only from India appearing in customs statistics, as against 672 tons of the previous year). As, however, the smuggling of this article has been repeatedly observed to be a malpractice which can he carried on with perfect impunity and much profit, it need not necessarily be assumed that the actual import of Indian tea has suffered any diminution. There is certainly no indication of less tea being consumed in Persia than formerly: The more the opium habit grows, the more Indian tea and (incidentally) the more foreign sugar will be consumed. The following figures represent the quantities of tea supposed to have entered by the small ports and landing-places along the coast north and south of Bushire. So rife has this illicit practice become that, as a matter of common knowledge among the inhabitants of the town, smuggling regularly takes place at a point only 6 miles distant from Bushire itself. So long as such delectable articles as tea and fire-arms are taxed heavily or their import interdicted, and so long as the coast remains what it is and no extensive coastguard service is organised, so long presumably will this state of things continue :—

Smuggled from :—	1906-07. Tons.	1907-08. Tons	1908-09. Tons.	1909-10. Tons.
Bahrein	46	75	123	150
Koweit	38	22	8	25
Shargah	...	8	...	...
Dubai	...	12	15	12

Note.—In the course of 38 days in 1909 18 tons were smuggled across from Koweit alone, and it is estimated that 10 cases (1,080 lbs.) a week, on the average, are fraudulently imported thence into Bushire. Bahrein, however, is by far the worst offender.

The Planters' Chronicle.

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THE U. P. A. S. I.

(INCORPORATED.)

The Scientific Officer.

Leaving here on Tuesday evening (10th instant) Mr. Anstead proceeded to Ootacamund to meet the Curator of Government Gardens and Parks, the Nilgiris, and inspect the proposed site for a Coffee Experiment Garden. After a couple of days there he would proceed on tour in the Anamalais, and he will subsequently visit Coimbatore and Yercaud.

The Indian Tea Cess Committee.

Mr. George Romilly is leaving India about the end of next month. As he would be unable to attend the meeting of the Committee in February, he has resigned his seat on the Committee.

The matter of electing a successor for nomination as a member has been submitted for the consideration of District Planters' Associations. It is very desirable that the U. P. A. S. I. should be personally represented at the Committee meeting of the 17th instant, in view of the effort that is to be made to get the bonus on Green Tea revived, and the manufacture of this class of tea resumed in Southern India on an important scale.

Samples of Produce for Exhibition.

If last year's Miniature Exhibition is to be repeated in connection with the Annual Meeting in 1911, it is very desirable that Tea, Coffee, Cinchona, Pepper and Cardamoms should be fairly represented. Of Rubber there were excellent specimens in August last, of Tea but a few samples. Coffee planters only received intimation that exhibits were wanted after they had sent all their crops away. On this account early notice is now given, so that coffee producers, in particular, may have an opportunity to reserve suitable selections. Probably no one desires that the Exhibition should be a *large* one, but it would certainly gain greatly in interest if it were to attract representative samples from every planting district in Southern India.

If desired, samples of estate tools, tapping knives, &c., might be arranged for, and various products might be shown in different stages of preparation. As the laboratory premises will not be available this year as an Exhibition Room, the U.P.A. office will have to be utilised for this purpose. Consequently, the earliest possible intimation should be kindly given (to the Secretary) as to the number and size of the exhibits that are to be sent in. If this is done, every effort shall be made to group the specimens systematically, and to display them as effectively as circumstances will permit.

Scientific Officer's Papers.

LII.—Canker on Hevea.

In Note 72 (*P. C.*, Vol. V, p. 516) attention was called to a 'Canker-like' disease which appeared on the tapped bark of Hevea. This disease has also been found in Ceylon and has been investigated by Mr. Petch, the Government Mycologist, and is dealt with in a Circular of the Royal Botanic Gardens, Vol. V, No. 13, dated November 1910. Mr. Petch there says, "During prolonged rains of 1909 and 1910 the renewing Bark on the tapped surfaces decayed in many cases. The decay was first indicated by the appearance of vertical black lines just above the tapping cut. When the bark was cut out it was found that these lines extended into the wood, and that they were present on the cambium before they were visible externally. The bark along these lines rotted, and left long narrow wounds extending down to the wood. In some cases the decay travelled downwards and involved the untapped bark also, When the rains ceased the decay stopped and the wounds healed up, but the renewal was of course rough with vertical swollen ridges of wound tissue.

"This decay does not appear to be due to 'canker.' The colour of the diseased bark differs, and the decay ceases when fine weather sets in. Latex can be obtained from the affected tapped cuts, as there are strips of sound bark between the black lines. It does not therefore seem advisable to stop tapping when this occurs, unless it can be shown that it is due to some organism which can be conveyed from tree to tree by the tapping knife. Up to the present all attempts to reproduce this decay by means of the organisms found in the decayed bark have failed, and it seems probable that it is due to only to an excess of moisture on the layers exposed during the tapping. It is scarcely worth while to excise these black patches, because the amount of injury caused by excision is greater than that caused by the decay of the bark."

This Circular deals minutely with the Canker proper of Cacao and Hevea. Fortunately for us, the real Canker of *Hevea*, caused by the Fungus *Phytophthora Faberi*, appears to be at present of rare occurrence in South India, but in view of its importance the following extracts from Mr. Petch's valuable report on it are reproduced :—

"Shortly after my arrival in 1905 a blackening and decay of *Hevea* fruits occurred. Examination showed that they were attacked by *Phytophthora*, and the disease was attributed to that. The diseases of cacao and *Hevea* pods were stated to be similar, if not identical, in the *Tropical Agriculturist* for August, 1905.

"During the heavy rains of 1909 the renewing bark on the tapped surfaces died back in some districts, and some investigation was carried out to determine the cause, if possible. The disease was shown by the presence of black longitudinal streaks which extended through the bark into the wood. When the diseased wood was cut out of the tree and placed in glass dishes, minute globules of bacteria appeared on the black lines within 24 hours; and on keeping diseased bark, *Nectria diversispora* was produced in a few days. Inoculations were made with both these organisms. The bacteria were transferred to culture flasks, and after it was certain that no fungi had been transferred with them, inoculations were made on newly tapped surfaces, both by inserting them in the cortex and by brushing them over the surface. Ripe *Nectria* spores were obtained from diseased pods. The pod was placed on paper under a bell glass and as it dried the spores were ejected in a brown circle clear of the pod. These were sown in a culture solution (sugarcane extract), and proved to be capable of germination and

free from bacteria and other fungi. Inoculations were then made with these in the same way as with the bacteria. All proved unsuccessful (*Tropical Agriculturist*, December, 1909). It is most probable that this disease was not 'canker,' as usually understood; but the experiments serve to demonstrate the harmless nature of the common *Nectria* on dead *Hevea*."

"The external symptoms on *Hevea* are by no means so clear as on cacao. On young trees the bark may appear darker, but where the tree has acquired a thick brown outer bark there is practically no outward indication. In some cases the bark exudes a reddish or purplish liquid; in very wet weather this occurs when only a small patch of bark is diseased, but under ordinary conditions it only happens when a large area is affected. In many cases the disease has only been discovered by observing that the tree suddenly ceased to yield latex. Whenever this happens the bark should be slightly scraped here and there to see whether it is discoloured internally.

"Healthy *Hevea* bark is white, or yellowish, or clear red, or sometimes mottled red and white, internally. When the outer layer of brown bark is scraped off a green layer is found, at least on trees which have not acquired scaly bark, overlying the laticiferous tissue. But when the bark is 'cankered,' a black layer is found beneath the outer brown bark and under this the laticiferous tissue is evidently discoloured. When recently diseased it is grayish, or 'neutral tint,' with a well defined black border, but in advanced cases it becomes claret coloured or purple-red, 'not unlike the inside of the fruit wall of a ripe mangosteen.' Frequently the bark is dirty-red when cut, but darkens to purple-red soon after exposure.

"No latex exudes when the cankered bark is cut, any area which does not yield latex when pricked with a penknife should therefore be scraped here and there to see whether the layer beneath the brown bark is still green, or, in old trees, whether the laticiferous tissue is discoloured. But pricking the bark is not a reliable test for 'canker'; for the outer layers may be diseased while the inner layers are healthy, and in that case latex will flow from the inner tissues when the bark is pricked, although it may be diseased half way through.

"If a moderately thin slice of 'cankered' bark is gradually broken by bending it while still moist, so that the break is not too sudden, strands of rubber will be found stretching across the crack. The rubber is not consumed by the fungus, as has been suggested, but is coagulated in the latex tubes, probably by the substances produced by the fungus is its growth.

"Cracked, scaly bark is not necessarily a sign of Canker in *Hevea*. In the majority of cases of canker the bark is not cracked. The formation of scales which can be easily detached from the stem appears to be normal phenomenon in old *Hevea* trees, as it is old jâk trees, and it is apparently induced prematurely by tapping. But quite young trees may develop scaly patches without any discoverable cause. When these scales can be detached easily, and leave sound laticiferous tissue, usually covered with a brown film on the stem, there is no 'Canker.'"

(To be continued).

RUDOLPH D. ANSTEAD,
Planting Expert.

The Head-quarters of the Inspector-General of Agriculture in India are now at Pusa. All communications to that Officer should be addressed to him at Pusa (Bengal). All parcels intended for his office and sent by Railway should be consigned to Waini, B. & N.-W. Railway.

DISTRICT PLANTERS' ASSOCIATIONS.

Malabar Coast Planters' Association.

Minutes of the Quarterly General Meeting held on the 17th December, 1910, at the Trichur Club.

PRESENT.—Messrs. G. H. Davey, H. B. Kirk, R. DeRoos Norman, E. F. Norman, R. G. DeRoos Norman, T. C. Forbes, J. N. Hall, G. R. R. Parker and R. L. Gudgeon, Honorary Secretary.

Honorary Member.—Mr. H. Brown.

Guest.—Mr. John Thompson.

Proposed by Mr. R. L. Gudgeon, seconded by Mr. H. B. Kirk, that Mr. G. H. Davey take the Chair in the absence of Mr. Barber, the Chairman.

Read congratulatory telegram despatched to the Maharajah of Travancore on the occasion of his Silver Jubilee and reply.

Secretary's Report.—" Gentlemen,—I have very little to say: the progress of the Association still continues and I think we can congratulate ourselves at the number of people present considering we are almost in the Christmas week.

" The total number of Estates which have joined our Association number 10 with a total acerage of 7,913 acres planted. I estimate another 2,000 acres will be planted next year. There has been some private correspondence with the Nelliampathy Planters as regards their joining this Association, but no definite proposal has been put forward.

" The present income of the Association is by acreage cess

	Rs.494	9	0
17 private members' subscription	,, 170	0	0
Total...	,, 664	9	0

" This is not enough to carry on with. We have to pay the U.P.A.S.I., Rs.329-11-4; Scientific Officer, Rs.100; Laboratory Fund, Rs.200; Delegate at the U.P.A.S.I., Rs.100, which leaves a dead loss of Rs.65-2-4, and nothing to go on with for ordinary expenditure, and I must ask you to approach your Agents for an increased subscription. A further tax of 6 pies per acre would, I think, keep things going.

" I must also ask you to increase my writer's pay from Rs.10 to Rs.25. Since our last Meeting about 3 months ago the average despatch of Association letters was about 15 per working day.

" All the books are here on the table for your inspection.

" I have not paid the Rs.720 which I have received towards the local 'King Edward Memorial Fund,' as I have practically heard nothing about it except for one circular letter since the proposal was first brought forward four or five months ago.

" I have since heard a Committee Meeting is to be held on Thursday next.

" All the money I have received for the 'Lady Ampthill's Nursing Institute,' 'South Indian Planters' Benevolent Fund,' and 'Rubber Exhibition' have been forwarded to the proper quarters. I should particularly like to draw attention to the Lady Amphill's Nursing Institute. Through the subscriptions of 12 members it entitles all the members of the Association, namely, 31, to all the advantages of the Institute. This seems very unfair and I propose the non-subscribing members be written to with a view of trying to get them up to the scratch. I have no doubt some of them already belong to the Institute either by private subscription or through some other Association.

"Your particular attention is called to the letter I have just received from the Honorary Secretary of the Mundakayam Planters' Association. Regarding Scientific Officer, I think, after reading Mr. Petch's article on Canker published in *Times of Ceylon*, December 7th, you will unanimously agree to support them."

With reference to the necessity of raising the rate of acreage cess Mr. Davey proposed that the Honorary Secretary be requested to circularise the members, notifying them that a proposal to raise the cess to 1½ annas per acre, which is the same rate as is in vogue with the other Rubber Associations, will be brought forward at the next Meeting and members should, therefore, either manage to be present or depute somebody to represent their views, should they be unwilling to agree to the same.

Seconded by Mr. Kirk, and carried unanimously.

S. I. P. B. F.—Mr. Gudgeon informed the Meeting that the sum of Rs.230 had been collected and remitted to the Secretary of the U. P. A. S. I., and further informed the Meeting that he is still willing to receive subscriptions.

Lady Ampthill's Nursing Institute Fund.—The total received as mentioned in the Secretary's Report is Rs.155.

Proposed by Mr. J. N. Hall and seconded by Mr. G. R. R. Parker.—That this Meeting while recording its satisfaction at the amount collected would ask the Honorary Secretary to forward a copy of these minutes to those members who have not subscribed and ask them to reconsider their decision.

Read and recorded the correspondence from the Mundakayam Rubber Planters' Association and also portions of Mr. Murphy's private letter to Mr. Gudgeon and noted same.

Resolved.—That this Association will be very glad to consider any such scheme, and if thought desirable that 2 members of the Association will meet Mr. Murphy or any other gentlemen with the object of drafting a scheme.

Draft Regulation for the Prevention of Rubber Stealing.—Read.

Proposed by Mr. R. De Roos Norman, seconded by Mr. W. E. Forbes, and carried :—That the draft Regulation be circulated to all members of the Association and that they be asked to send in their views and suggestions, which will be discussed at the next Meeting. Meantime that this Association's thanks be conveyed to Mr. Richardson for the interest he is taking in this matter.

Scientific Committee.—Mr. Kirk read the following paper :—

"*Preliminary Report on Manuring Experiments for the M. C. P. A.*—Experimental tapping commenced on Rows A. to F. on Dec. 1st, 1910.

"*Row A*—Every other tree in this row has been pollarded at 10 ft. with a view to compare the yields obtained from these trees with those of

"*Row B*—in which every other tree has been cut out and the roots removed.

"*Row C*—is an ordinary row without manure.

"*Row D*—has been manured with the manure recommended by Mr. Kelway Bamber, after analysing the soil in this field.

"*Row E*—is a mixture recommended by Mr. Anstead similar to Mr. Bamber's, but with a portion of Nitrolim added.

"*Row F*—has been manured with Nitrolim only.

"Results from all these rows are being kept separately in pounds of dry rubber and will be published when definite results are obtained. The field in which these experiments are being made is $8\frac{1}{2}$ years old, planted 20 ft. by 10 ft., and is the best latex-yielding field on the Estate. In rows A & B the alternate trees which have either been pollarded or cut out are 10 ft. apart trees. In rows D & E 5 lbs. of manure has been applied to every other tree and in row F, $2\frac{1}{2}$lbs. of Nitrolim to every tree. In all three cases the manure has been well forked in 9 in. deep in two rows 4 ft. broad, 4 ft. away from each 20 ft. line."

Resolved.—That this Meeting thanks Mr. Kirk for this information.

Mr. Kirk informed the Meeting that he understood from Mr. Anstead that though he searched on all the Estates of this Association that he visited he did not see or find signs of serious disease or die-back.

This Meeting records its satisfaction at this information.

Rubber Exhibition Fund.—The Honorary Secretary informed the Meeting that the total received as subscriptions for the Rubber Exhibition Fund is Rs.1,805-2-11 which he has forwarded to the Secretary of the U.P.A.S.I.

Mr. Kirk proposed that this Meeting while recording its satisfaction at this would suggest that, as the Honorary Secretary states that only one Estate has not fallen in with the proposal to pay annas 4 per acre, the Honorary Secretary be asked to once again address the Estate in question and ask it to fall in line with the rest. Further that the Honorary Secretary do convey the thanks of this Meeting to H. H's Government for their generous support, as also to the private firms who have subscribed to the Fund.

Mr. E. F. Norman seconded, and it was carried unanimously.

The Chairman proposed a vote of thanks to the Honorary Secretary for the able and careful manner he has conducted the affairs of this Association.

Carried.

Proposed by Mr. Gudgeon, and carried.—That this Assembly do record its thanks to the Honorary Secretary and Members of the Trichur Club for their kindness in allowing this Meeting to be held in the Club Rooms.

With a vote of thanks to the Chairman the Meeting ended.

(Signed). R. L. GUDGEON,
Honorary Secretary.

COMPARATIVE VALUES OF WEST AFRICAN COFFEES.

The *Journal d' Agriculture Tropical* gave, some time ago, information obtained from an article in *Teysmannia*, which presents the results of investigations as to the relative value of three West African coffees, namely *Coffea canephora*, var. *kouillouensis*, *C. excelsa* and *C. robusta*. The samples examined had been prepared by the wet method, and the parchment had not been removed, owing to the want of the apparatus necessary for the purpose. The following description of the prepared samples has been given by an Amsterdam broker: Kouillou, good berry, imperfectly cleaned, which would be better for the removal of the parchment; taste somewhat acid, wanting in delicacy; worth $26\frac{1}{2}$c. to 27c. Excelsa, strongly resembles the small variety of Liberian; colour yellow, skin brown; taste leaves something to be desired; value 26c. to $26\frac{1}{2}$c. Robusta, berry small, colour uniform, taste satisfactory, value 27c. to $27\frac{1}{2}$c.

RUBBER.

Castilloa Rubber in Mexico.

[*Concluded.*]

The question then arises, at what distance are we to plant ? I decidedly condemn close planting, as it leads to a disproportionately whipilke growth of the trunk. I would also emphatically warn against too open planting. I think the error of the latter practice is conclusively proven by the following instance that has come under my observation. Two years ago I visited a large *Castilla* plantation on which the trees had been planted 21 x 24 feet apart. The trees were five years old, and investigation disclosed the fact that a great percentage of the trees, especially those which had been growing on dry knolls or exposed places, had a bark very rough, scaly and full of longitudinal fissures. The inner bark, in which the latex vessels are situated, was very dry and the latex in the ducts had coagulated. In many places on the bark exudation of latex had formed scrap rubber. The only way in which this condition of the trees can be remedied is to allow the weeds to grow up and underbrush to develop. This vegetation shades the trunk and in due time new bark is formed and the old is thrown off. This process takes at least two years, and is successful only in case the cambium has not been injured.

In deciding about the distance at which to plant we have to take the following two primary factors into consideration. The trees must not stand so close as to impede the growth of each other, and they must not be far enough apart to leave the trunks exposed to sun and wind.

A too close planting and the consequent struggle for existence results in less diameter growth, while growth is stimulated as the trees are striving for the light above and the lower branches which are cut off from light gradually die and fall off. But if thinning is not resorted to the whole stand is kept back and many of the trees become spindling-topped and crooked. This waste is not alone due to the fact that numerous trees die, fall to the ground and rot, but still more to the fact that by their fight for existence they interfere with the growth of the better tees, which are to make the final harvest. The thinning is therefore made in order to accelerate as much as possible the diameter growth. The principle of such a thing is to substitute for nature's wasteful struggle a systematic removal of the weaker and inferior trees. It is of the greatest importance that sufficient judgment be exercised in this procedure, straight, tall trees with well developed thrifty tops are left in preference to spindling, weak-topped trees or crooked and unsound ones. Trees affected by fungus disease should invariably be removed to prevent the spread of the disease to other trees. Where there is a group of equally good trees it is often best to remove one or more, as the remaining trees will produce a better result if given every chance.

It is usual to divide the trees in a stand into four classes : dominant, intermediate, suppressed, and dead. Dominant trees are those whose crowns are entirely open to sunlight. Intermediate trees receive their sunlight from above, but their crowns are shaded on the sides, and are liable to become suppressed,. Suppressed trees are those which are entirely over-topped by other trees and are slowly dying. Such trees and those that are already dead should be cut down, Most of the thinning is done among the intermediate trees. Here the struggle for existence is most severe, and the best trees are considerably assisted by an improvement thinning. It is always better to make light thinning at frequent intervals than to take out too many trees at once, as this opens up large patches of ground, in which weeds easily get a foot-hold.

It is impossible to lay down any hard and fast rules as to the proportion of the number of trees which should be removed. In thinning the operator must always follow his judgment. By wise selection a stand can be made productive up to its maximum capacity. It is necessary to emphasize the larger increment in growth of the trunks which can be secured by judiciously thinning so as to permit crown development.

When the trees grow larger and older they crowd more and more so that a severe struggle for existence ensues. A tree derives its food materials through the roots from the soil in the form of mineral solutions. These pass up into the crown of the trees, and are then distributed through the leaves. The latter take in carbon dioxide from the air and by the action of sunlight on the chlorophyll or green material of the leaves carbon products are formed which go to make the wood. These substances are carried down to the tree and deposited in the form of an annual ring. The width of these rings, or the rate of diameter growth of the tree, depends upon the fertility of the soil and upon the amount of foliage which can be acted upon by sunlight.

Our *Castilla* trees have a tendency of growing rank especially if planted close. I have often been asked if there is any means of increasing the growth in girth and retarding the growth in height. Pollarding is the most effective method, and several Mexican planters are now cutting off the top of the young trees in order to encourage an increment in girth growth. It is well known in tree culture in general that by getting lateral branches to develop the growth of the trunk increases. Besides by pollarding this can be effected by means of V or A shaped incisions above or below the starting point, the V cut beneath a bud or a branch retarding and the A cut above accelerating growth. Retarding is also effected by partial strangulation by means of 20 or 30 spiral coils or springs round the base, depression to the horizontal of vigorous upward growths also perpendicular elevation of weakly ones. Every planter has noticed that the trunk of a rubber tree grows more rapidly in girth after tapping operations have commenced. For this reason it is important that the cuts or incisions be made at regular intervals so as to promote symmetrical growth of the trunk. Few of these methods are, however, practical on a large plantation. It is only the last one which must be taken into consideration for commercial culture on a large scale.

——o——

Feeding-up Rubber Trees, the Best Preventive against Root-fungus (Fomes semitostus).

Dr. D. Sandman, of "Purub" fame, in his brochure on "Dangers, Mistakes, and Improvements connected with the Production of Rubber in Asia," discusses the question of root-disease, its cause and remedy as follows :—

"On several plantations larger portions of ground may be seen where the fungus has killed the trees. Up to now no remedy has been found, so that there is the danger of whole plantations, or at least of the neighbouring trees, being lost. In order to prevent this trouble spreading, trees that have become infected are rooted out of the ground and burned. The hole thus formed is left open for a while, so that air and sun may do their good work on the soil. But these precautions apparently, although thorough as a method, are no guarantee that the neighbouring trees will not have become infected as well, for their delicate fibrous roots may have touched those of the up-rooted trees, and so have already become contaminated. It is not known to what extent close-planting facilitates the growth of the root-

fungus, but one can imagine that insufficient nourishment is not without its bad effects, and that trees of the same kind, which require similar nourishment and are obliged to obtain the same from one small piece of ground, are not so well nourished as the same number of those trees on more extensive tracts of land. It is generally, if not universally, agreed that all plants need stimulating in order to secure their food from the ground, and that they can only draw such nourishment when it is in a form in which they can assimilate it. In the Brazilian forests there is rich vegetation of various kinds, in the midst of which the Hevea trees are planted, either singly or in groups, over a widely-extensive area, where no fungus, nor anything of that description, can exist; at least, I have not heard of a fungus nor anything of that sort growing there. There the trees evidently are better nourished and more able to withstand or throw off injurious influences, which weaker plants are certainly less able to do. Besides this, it frequently happens that, with cultivated rubber, these already weak trees are tapped often far too much, in order to gain, by means of the intentional 'tapping-to-death' method, a profit from them, before they are removed from the land. In this way the trees become so weak that every kind of injurious growth finds in them rich nourishment to assist their baneful development. If, as is claimed by some, the Hevea grows better in the Brazilian forest than of the planted estates in Asia, it is due, not to better soil and more suitable climate and surroundings, but because the trees have a larger area to themselves. Lately, however, the planters have expressed their disapproval of close planting, and are now putting the trees further apart."

"Weeding, although more expensive than close-planting, is preferable. To keep down weeds, however, cover-crops can also be planted, *Passiflora fœtida*, *Crotalaria striata*, *Mimosa pudica*, *Desmodium triflorum*, *etc.* These serve three purposes: they keep down the weeds, supply nitrogen to the soil, and through that to the trees; and, on sloping lands, prevent soil erosion and keep the roots covered. In Java, it is said that the *Leucaena glauca* has been used with success. In six months it is said to have covered an area five metres broad. It is a bush, and must be cropped and kept low."

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Para Rubber in West Africa.

According to *Tropical Life*, the African Rubber Company's 31,537 Pará rubber trees are doing exceedingly well, climatic conditions being very similar to those of their habitat. Unfortunately, the first plot (6,000 trees) was planted in irregular lines and much too close to one another. Some of these trees will have to be cut out, and elsewhere trees that have been doomed has given, we are told, 5 and 6lb. of dry rubber per annum, and still seemed none the worse for it. All the trees planted within the last two years are evenly planted at 20 ft. by 20 ft. In spite of the close planting of the first lot of trees they have thriven remarkably well, as a glance at the table below will show.

Table showing Ages and Measurements of Pará Trees at Luku-Luku, near Axim.

Approx. No. of Trees.	Age.	Average Height.	Height of Tallest.	Average Girth 3 ft. from base.	Girth of Largest.
9,077 ...	2 to 9 mos.	4 ft.	5 ft.	...	...
4,260 ...	12 to 15 mos.	8 ft.	12 ft.	...	...
2,100 ...	18 mos.	13 ft.	17 ft.	4 in. to $4\frac{1}{2}$ in.	7 in.
10,000 ...	26 mos.	19 ft.	24 ft.	$6\frac{1}{2}$ in. to 7 in.	$8\frac{3}{4}$ in.
2,000 ...	36 mos.	26 ft.	31 ft.	9 in.	14 in.
2,000 ...	40 mos.	28 ft.	33 ft.	10 in.	$14\frac{1}{2}$ in.
2,000 ...	45 mos.	28 ft.	34 tt.	11 in. to 12 in.	19 in.
31,537 ... Total.					

SELECTED CUTTINGS.

The Essentials for the Growth of Plants.

There is always before the mind of the practical agriculturist, and of the agricultural investigator, the consideration of the surroundings of the plant, in relation to their effect on its life, and to the limitation by them of the possibility of its existence. If plants, in a given instance, are thriving, how can they be protected from adverse influences, and more, be made to increase the yield of their produce? If, again, certain plants show lack of vigour, or do not produce reasonably good crops, what must be done in order to restore them to health and a proper state of activity, or vitality? It is evident that, given a well established, useful plant, a partial answer to these questions can be obtained by reference to its surroundings; and it may be that a reasonable consideration of these will supply a clue as to future procedure for the benefit of the plant.

Careful advertence to the surroundings of the plant is always justified, but there is a danger that it will not be achieved with thoroughness, because the continual recognition of its necessity is likely to bring about the loss of the mental view of the plant itself, on account of the intentness of the gaze upon its environment. This is partly due to the fact that the ordinary needs of plants are known. They are not, however, sufficiently present to the mind, in particular instances, to make it unnecessary to recapitulate them, in the light of the special conditions. Thought given to the plant, in relation to all its possible requirements, will often prevent the waste of time and money on useless measures for its improvement, and will generally make it evident as to what is the best course to adopt in the definite event.

The importance of obtaining a thorough view of the ideal surroundings of a plant, in the light of its needs, will be more readily realized after the following principles have been considered. The growth of a plant does not rely upon several independent circumstances, any one or more of which may be absent, provided that the others are present in abundance; there are, on the contrary, several conditions that must be satisfied, and the omission or insufficiency of any one of them will prevent its proper development from taking place. These conditions are called limiting factors, because each of them alone is always, and absolutely, necessary to the growth of the plant. Further, as is stated in a recent article (The *Journal of the Department of Agriculture of Victoria*, Vol. VIII, p. 353) that deals with the subject, and which may be consulted with advantage, the factors requisite for the life of a plant mostly act together throughout its whole existence; they do not show their influence successively. The result is that the partial absence of any of these factors, at any time, only allows the others to exert their influence to an amount that is permitted by the degree to which it is present; while its total absence completely prevents them from being useful in any way.

It will be well, now, to consider the nature of these essentials that must be satisfied simultaneously, and each in its proper degree, before the growth of green plants can continue. They are, in order of immediate urgency: (1) the presence of water; (2) a certain range of temperature; (3) a supply of mineral salts; (4) the presence of certain kinds of light; (5) air containing oxygen and carbon dioxide. These will be taken in order.

The necessity of water to plants is that which is most readily recognized, and the want of this essential is most quickly shown by them. If it is considered alone that man is dependent upon the rainfall for this requisite,

it is easy to regard him as being helpless in its absence or insufficiency, owing to the failure of the latter. That this view of the matter is not justified is made evident from a review of the progress that has taken place in matters of irrigation, and what is more important, in that of the treatment of the soil for the purpose of conserving the amount of moisture that it contains already. The knowledge that has been gained concerning surface tillage has opened up, for the agriculturist, parts of the world that were formerly considered of too arid a nature ever to be of any use to him ; and it has given him, in places subject to intermittent droughts, a means of saving the water in the soil, for the uses of his crop, so that he is assured of some return for his toil, even in circumstances under which he would have previously despaired. The importance of the supply of water to plants will be realized all the more clearly in the apprehension that its insufficiency or absence lessens or destroys the usefulness of all the other factors. However rich soil may be, the plants in it can only make use of as much of the food that it contains as is permitted by the proportion to which their needs for water are satisfied. Artificial manures, in the absence of sufficient water are wasted in a large degree, for the immediate crop. They are, indeed, directly harmful, in any quantity, for they make it less easy for the plant to absorb what water is present, by stunting the growth of the roots, and by increasing the strength of the soil water solution, so that the efficiency of the root hairs in taking it up is seriously impaired.

Most green plants show distinct preferences in the matter of temperature ; this is the most powerful factor in regulating the arrangement of the different kinds over the surface of the earth. In temperate climates, the distribution of heat or cold throughout the year is of the greatest importance to the agriculturist. In the tropics, it only requires consideration in relation to the possibility of the introduction and acclimatization of plants; it is always sufficiently high for the needs of those which are indigenous.

The quantity of mineral salts that is necessary to plants is very small; where these are present abundantly, however, the plant will make use of much more than the requisite minimum, with a probable increase in its development. The concern of the practical agriculturist is, naturally, most particularly connected with the knowledge of means to supply the essential amounts of this kind of plant food. It is a matter of interest that some mineral constituents, if they are deficient, can be replaced to some extent by others ; examples of this substitution are magnesium for calcium, and silica (in cereals) for phosphoric acid ; it is assisted to be of use to the plant, by the power of selection that the latter possesses—a power which enables it to make the best of what is at its disposal. Short mention, only, is required of the fact, that the agriculturist can come to the assistance of the plant with arrangements for following rotation and the employment of artificial manures.

It is a matter of common knowledge that green plants require light, though they do not succumb, for some time, on being deprived of it. The necessity for light is bound up with that for air, and the two can be best considered together. A plant deprived of air would most quickly suffer for want of oxygen, which is necessary to it, and which it can use whether light is present or not. The case is different in regard to carbon dioxide, for this can only be used with the aid of light. Under ordinary conditions, the former requisite is always present, but it is of no use to the plant unless the right kinds of light are available to assist in its assimilation. Practical considerations rarely require to take account of these essentials, but they are interesting because, like manures and water, they supply examples of limiting factors that are mutually interdependent.

The contemplation of these facts, like that of many others connected with agriculture, serves, for one thing, to bring forward the importance of proper tillage. Without water, food in the soil cannot be used; without proper conditions in the soil, food cannot be produced and liberated there; without the presence of this food, the plant cannot make use of the light and air by which it is surrounded. Proper tillage provides for the regulation of the first two of these, so that the third condition, which is always fulfilled, may be employed by the plant to the best advantage.

It will be evident, now, that the minimum extent of the presence of any one of the essentials of plant life causes a minimum employment of the others. This explains why, often, the supplying of a single factor, to its proper extent, will cause a large and significant increase in the crop yielded by a plant, and why, for the determination of this factor, the most successful results will be obtained by a thorough and methodical consideration of its requirements.—*Agricultural News.*

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House Flies and the Public Health.

It has now been definitely proved that the dangers resulting from House Flies are of vital importance to the general public. *As carriers of the germs of such diseases* as typhoid fever, tuberculosis, infantile or summer diarrhoea, etc., etc., they are a potential danger. Wherever they occur, they are the embodiment and emblem of filth, and by carrying the germs of the above mentioned diseases on their legs and bodies, they pollute food, especially milk and ripe fruit, and spread the infection. *No fly is free from these germs*, their presence therefore in a dwelling house is a source of danger, and at the same time an indication of filth in the neighbourhood or of defective sanitary conditions.

House Flies breed *chiefly in stable manure*, also in decaying vegetable matter and excrement.

In large towns exposed heaps of stable refuse and the contents of dust bins afford suitable breeding grounds, which annually produce millions of these insects, and so long as local authorities permit the present conditions to remain, so long shall we have the serious infantile mortality rate, the present percentage of deaths from typhoid fever, and the spread of tuberculosis.

PREVENTIVE METHODS.

In towns, all stable manure should be stored in dark, fly-proof receptacles, and kept closed. The contents should be removed within 6 days. Farm-yard manure should be removed within the same time, if not used, and stored at least a quarter of a mile from any dwelling house.

All kitchen and household refuse of an organic nature *should be burnt.* If placed in dust bins they should always be kept tightly closed. Where the disposal of such refuse is not possible within a few days, it should be sprinkled with chloride of lime after each addition.

In houses the windows of kitchens and larders should be properly screened. Milk, fruit, in fact all food, should be kept under muslin.

In sick rooms muslin screens should be fitted to the windows, especially the case of infectious diseases.

Flies may be killed by exposing blotting paper in saucers, previously soaked in a weak solution of formalin, 1 tablespoonful to a pint of water.

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(INCORPORATED.)

The Scientific Officer.

Mr. Anstead is now on the Anamalais. His report on his visit to the proposed site for a Coffee Experiment Garden will appear in next week's issue as one of the series of "Scientific Officer's Papers."

Arriving in Coimbatore on the 28th instant, Mr. Anstead will visit the local Agricultural College and then proceed to Yercaud, where he is expected to arrive on the 31st idem.

It is hoped that he will be able to visit Hunsur next month, for the purpose of studying coffee-curing operations, but arrangements in this connection have not yet been definitely made.

The International Rubber Exhibition, 1911.

The Directors of the two Companies in the South Travancore District have sanctioned an assessment of 4 annas per acre towards expenses in connection with the above Exhibition, provided that the majority of Rubber Estates in Southern India agree to the same assessment.

Mundakayam estates, with the possible exception of one, will pay the same assessment, and, as previously stated, the Malabar Coast Planters' Association has remitted subscriptions to the U.P.A.S.I. on the same basis.

King Edward VII Memorial Fund.

DONATIONS PER SHEVAROY PLANTERS' ASSOCIATION.

The following subscriptions to the King Edward Memorial Fund have been collected. They are intended for the "Hospital for Consumptives," Madras, and *not* the "All India Fund."

	Rs.		Rs.
Chas. Dickins ...	... 10	C. G. Lechler ...	... 5
F. D. Short ...	... 10	R. Gompertz ...	... 10
Father Rochet ...	... 6	S. Campbell ...	... 5
W. Rahm ...	... 10	E. Dickins ...	... 2
C. Rahm ...	... 15	Mrs. Gaitskell ...	... 10
R. A. Gilby ...	... 10	S. M. Hight ...	... 10
B. Short ...	... 15	W. W. Hight ...	... 10
L. E. T. Short ...	... 5	C. Imray ...	... 10
F. Carey ...	... 5	E. Large ...	... 10
B. Cayley ...	... 10	A. B. Kundaswamy ...	... 2
C. K. Short ...	... 5	G. Turner ...	... 10
W. I. Lechler ...	... 5		
		Rs.	... 190

Scientific Officer's Papers.

LII.—Canker on Hevea.

[*Concluded.*]

"The pod disease occurs every year, but is worst when the monsoon rains are unduly prolonged. It has not attracted as much attention of recent years, now that the demand for seed has diminished. The pods turn black, not a clear black such as may be produced by 'black blight' growing over them, but a sodden watery discolouration. They rot on the tree, the outer soft layer ultimately shrivelling and splitting, but the fruit does not dehisce and the seeds are not liberated. This was determined to be due to *Phytophthora* in 1905. In that year the disease threatened to destroy the whole crop, but it ceased when fine weather set in.

"It has frequently been observed that after the fruits have rotted, the green branches may also die back. I have no doubt that this is due also to *Phytophthora*, working back as it does in cacao from the pod to the stem, but the fungus has not yet been obtained from these dead shoots. No case is known in which the fungus, after starting on the fruit, has killed back the woody branches and produced canker in the main stem.

"Green *Hevea* shoots usually develop black patches or a continuous black coat. This is due to a black fungus, *Meliola* or *Asterina*, &c., which is purely superficial. At the base of each *Hevea* leaf there are two nectaries which secrete a sugary fluid, and the black fungus lives on this just as it does on the secretions of insects. This black film occurs on the fruits also. It is in no way connected with the *Phytophthora* disease, and it does not destroy the tissues beneath it. If it is scraped the underlying tissues will be found to be green and full of latex."

"As in the case of cacao, *Phytophthora Faberi* attacks both the fruits and the stem.

"The disease of the fruits is worst in exceptionally wet seasons, and it disappears when the rains cease. The soft green tissue which covers the woody wall of the seed capsule is very thin, and it does not appear to afford a suitable habitat for the fungus except under very favourable weather conditions. As the fruits do not grow on the main stem, the fungus does not travel into the latter and produce canker there; it may grow through the stalk into the green branch, and kill that for some distance, but it has not been found to proceed further. Since the fruits are now of little value, the only danger in the fruit disease is that the diseased pods may serve as a source of infection for the stem canker. The experience of pure rubber, or rubber and tea, estates would seem to show that this danger is small; for, canker has not proved such a serious disease on them as it was thought to be in 1904. The advice given in 1905, that diseased fruits should be collected and burnt, should be followed when the fruit disease is serious. It is the only possible measure, and it may prevent a certain amount of stem 'canker.'

"Excision of diseased tissues is the recognised treatement for the stem canker. All the discoloured tissue should be cut out and burnt. The difficulty here is the discovery of the "canker' before it has progressed so far that a large area has to be excised. The tapping coolies should be shown what cankered bark is like, and they should be instructed to stop tapping, and report, any trees which cease to yield latex, even if the flow ceases only on one cut. Many cases of canker are only discovered by the cessation of the latex flow, and it is not uncommon to find that the cooly

has been tapping for weeks on cankered bark from which he could not possibly have obtained a drop of latex.

"If the wounds caused by excision of cankered bark are small, cow dung and clay is the best covering that can be used to promote the healing process. But where they are large, so that the bark cannot be expected to grow over them, the exposed wood must be protected. If it is left unprotected, it is soon riddled by boring beetles which rapidly bring about the destruction of the tree. I would suggest that the exposed wood be tarred, except for a strip of an inch all round, and that this strip be treated with cow dung and clay as before."

"It is quite clear that in Hevea 'canker' is produced by spores which alight on the stem, and after germination produce a mycelium which gradually destroys the bark from without inwards; for in the early stages of the disease the discolouration begins beneath the outer layer and does not extend to the cambium. Further, each patch of diseased bark is the result of a separate infection. The spores blown by the wind, lodge on the rough bark, and if the stem is sufficiently moist a 'canker patch' is produced at the end of a few weeks. When estates are seriously attacked by canker, it would be worth while to spray the trunks with Bordeaux Mixture just before the monsoon rains set in. This would kill the spores which might subsequently fall on the stems, and prevent further infection during the wet weather. But it must be remembered that spraying will not cure a diseased tree. If the tree is 'cankered' the diseased bark must be cut out."

It is evident, therefore, from the above that our best plan at present is in the case of the first disease, which appears to be very likely caused by bacteria, to leave it alone, but to endeavour to ascertain whether it is conveyed from tree to tree by the tapping knife, a possibility which appears to me quite likely.

In the case of the second disease spraying, or rather painting, with Bordeaux Mixture has been found to be a practical method in the case of Pink Disease and could equally well be adopted for Canker. Mr. Coleman, the Mysore Government Mycologist, has found that this fungicide can be made to adhere in wet weather by adding Resin and Soda to it.

The mixture is made by adding 2 lbs. Resin mixed with 1 lb. of washing soda to 1 gallon of water and heating the whole for about an hour until the mass has become quite clear. One gallon of this mixture is added to every 24 gallons of Bordeaux Mixture.

As Mr. Petch points out, diseased fruits should be collected and burned should the Canker on them spread to the stems and cause damage to any considerable extent.

With the valuable information contained in the Circular so largely quoted above at our command, it should be easy to guard against this disease of Rubber, and a careful watch should be kept for its appearance, and should it appear it should at once be reported to headquarters in order that I may have an opportunity of inspecting it and organising prompt measures for its control. It is obviously more easy to check diseases in the case of a comparatively new cultivation like Rubber if they are taken in hand at once, than in the case of a cultivation like Coffee, for instance, which has been carried on for many years and in which diseases may have got a firm hold, and the importance of this point does not need emphasising.

RUDOLPH D. ANSTEAD,
Planting Expert.

Notes and Comments by the Scientific Officer.

93. *Action of Light on Rubber.*—It is usual in rubber factories to shield the rubber from direct sunlight and to have the windows of the drying rooms of red glass or screened with red materials. The following note taken from the December number of '*Knowledge*' bears upon this subject.

"M. V. Henri, writing in *Caout. et Gutta-percha* (vol. vii, p. 4371) describes the results of his investigation of the effect of ultra-violet rays upon pure and vulcanised Indiarubber. Specimens of the pure rubber and samples containing varying proportions of mineral ingredients were exposed, at a distance of about twenty centimetres, to the rays from a mercury vapour lamp with quartz tube. In each experiment there was pronounced deterioration in the pure material within twenty hours, the rubber becoming darker and more shiny, and showing cracks when stretched. In the case of vulcanised rubber greater resistance was offered to the action of the rays, an exposure of forty-eight to seventy-two hours being required to bring about these changes, while rubber impregnated with mineral matter was affected to a less extent, the deterioration being mainly restricted to the surface.

The presence of certain substances, such as antimony sulphide, promoted the decomposition ; while other compounds, including litharge, had a retarding influence. Moreover, rubber that had been separated from a solution was attacked more readily than that prepared by evaporation of the latex from the tree.

Since rubber exposed to the lamp in the absence of oxygen was not affected, the change must be attributed to oxidation promoted by the action of the ultra-violet rays. The rays effecting the deterioration were found to be those of a wave-length of about 3,650, which were absorbed by the rubber.

From the results of these experiments the practical conclusion is drawn that the envelope of a balloon ought never to be constructed of unvulcanised rubber, and that the cloth used should be coloured with some pigment, such as lead chromate, which would act as a screen in cutting off the ultra-violet rays, to which a balloon is the more exposed the greater the height it reaches."

94. *Hexacentris mysorensis.*—In my report upon my recent tour in South Mysore I mentioned this as being the name of the yellow flowered creeper at Angadi and Chickanhully bungalows. I am informed that it is not known as 'Ghaut Creeper' but its Canarese name is 'Wartey Beelo' and that it was introduced to Angadi from the Agoombi Ghaut below Koppa.

RUDOLPH D. ANSTEAD,

Planting Expert.

In the proceedings of the meeting of the Indian Tea Association held at Calcutta on 6th December, it was mentioned that the Government of India were to be asked whether any decision had been arrived at as regards assisting the proposed Indian section of the Festival of Empire Exhibition 1911 with a grant of money. A letter from Government has since been received, to the effect that no such assistance is contemplated.

DISTRICT PLANTERS' ASSOCIATIONS.

Wynaad Planters' Association.

Proceedings of Annual General Meeting held at Meppadi Club on January 11th, 1911.

PRESENT.—Messrs. Atzenwiler, Bissett, Ewart, Fleury, Halliley, Howland, Macleod, Mead, Powell, Romilly, Trollope, Waddington, West; Honorary Member, Mr. Blake, District Board Engineer; and C. E. Abbott, Honorary Secretary.

Mr. Trollope in the Chair.

1651. *Membership.*—Mr. J. C. Parker was elected a member. Proposed by Mr. Mead, seconded by Mr. Abbott. Mr. T. S. Gillatt rejoined the Association on returning to the District.

1652. The Honorary Secretary read the *Annual Report* and presented the accounts.

ANNUAL REPORT, 1910.

In submitting my Annual Report on the working of this Association I have to state that 9 Ordinary Meetings were held, as well as 2 Special Meetings, to consider proposed alterations in the rules.

There were 47 subscribers on the roll during the year.

We have to record with regret the resignation of three of our oldest members, Messrs. Mackinlay, D. Mackenzie, and Hockin, who have left the District.

System of Voting and Subscribing.—In referring to local affairs the first matter that claims our attention is the new rule passed at the Special Meeting held in October last. Some of us may have wished that the Association could have continued on the old lines of a Club in which all members paid the same subscription and met once a month to discuss subjects of common interest. But when the system of subscribing on an acreage basis to the U. P. A. S. I. was adopted it perhaps became inevitable that a change should take place in the voting basis of local Associations. In Wynaad we have decided to let the individual vote remain but to allow 1 vote for every Rs.12 of acreage subscription count in addition, with the proviso that no Company or individual may count more than half the total number of votes held by all the Members.

A statement has been prepared and is now placed before you showing how this arrangement will work. This statement may require correction. The Association has existed since 1874 on the basis of personal subscription and individual voting; we still have some original members on our list. It has done good work under the old system and will I hope long continue to.

Roads.—Complaints have been made during the period under review about 4 Local Fund roads: the Chundale-Sholadi, the Vayitri-Achoor, the Vellera Mulla and the Sultans Battery-Noolpoya Roads. It is not much use going into the details of our complaints on this occasion.

But, speaking generally and without special reference to last season or any particular season, it may be said that the great fault is, that the work is never begun at the proper time. This has been recognised by former presidents of the District Board and District Engineers, who have, however, found themselves unable to remedy it. The year's work ought to be begun in January and pushed forward during the two following months when labour is usually plentiful, and the metal collection could be almost completed. As things are, although the Engineers' estimates are prepared and sanctioned

long before, no contracts can be given out and no work commenced before the beginning of the official year on April 1st. As far as Wynaad is concerned this is a most pernicious system. All the coast coolies are away at work in the low country during April and May. So it is exceedingly difficult to get any work done before the monsoon. Even the drain clearing cannot be completed, and the metal which has often been spread in the dry months is washed out of the ruts by the first heavy rain. The metal collection drags on till December and on some roads is not even now completed though it is supposed to be finished by August. If this method of work is to be considered unchangeable and in the nature of things, Wynaad roads will never be in a satisfactory state. But it is impossible to understand why the same arrangements should not be made on Wynaad Local Fund roads that enable the Public Works Department and the Nilgiri District Board under precisely similar conditions to get their work done at the proper time.

Police.—Some Inconvenience has been caused by there being no investigating staff at Meppadi. The Association passed a resolution at the March meeting, which Mr. Squire promised to forward to the Inspector-General of Police.

Theft of Tea Plants.—A case of plants being stolen from a nursery was reported from Cherambadi. This is a new form of vice in Wynaad, and it is hoped it will not become common. Purchasers of tea plants ought to be careful of the source of supply.

The Planters' Chronicle.—This has been published weekly since January. The bound volumes together with the yearly reports of the U. P. A. S. I. proceedings will be found very useful to planters as books of reference on all subjects of interest to them.

Labour Law.—Act I of 1903 is still in force in the Nilgiri District and in the Wynaad Taluq of Malabar, and nowhere else. In its present form the Act is not likely to be adopted by any other District. If it is ever amended by the Madras legislature, it is unlikely that the amendments will be in favour of the Planting community. Under the circumstances it was decided at the Bangalore Meeting that this subject should no longer be discussed by the U. P. A. S. I. unless at the special request of a delegate, who has to give a month's notice of the resolution he intends to bring forward. As regards our local experience of how the Act works I may as well avoid controversy, and merely remark that while it is almost impossible to get warrants which are issued against defaulters, executed, neither this Act nor any other Act is likely to be of much use. Our thanks are due to Mr. Wood, the Collector of Malabar, for the trouble he has taken to help us to clear up some doubtful points of procedure and the present Vayitri Magistrate, Mr. J. Rama Panikar, for having done all he can to help us in working the Act. I have only once had to go to court myself during the year; but I take my opinion from the testimony of several other members of the Association.

The Fugitive Offenders Act.—Some correspondence has passed about the possibility of using this Act against absconders under the Labour Law. We have now had a definite statement from the Collector of Malabar that it cannot be so used.

Tea Stealing Act.—An attempt is being made to get an Act passed on the lines of the Coffee Stealing Act for the protection of Tea Planters. The difficulty seems to be that the Coffee Stealing Act is efficient because it protects growers against the theft of the article in the form in which it is exported, that is in the raw state. A handful of broken coffee if found in an estate cooly's house is sufficient to ensure a con-

viction. The same man might have a bushel of roasted and ground coffee by him, and go free. The definition of coffee in the Act shows that there is some objection to making it penal to possess coffee ready for consumption, and a similar Act would only help us to check thefts of green tea leaf. What we want to be protected from is thefts of made tea. Tea is certainly being stolen in small quantities at a time by factory coolies, and the loss mounts up to something considerable in the course of the year. It is also being largely stolen on the roads to the ports of shipment. And the stolen article finds a ready sale. Mr. Nicolls found good orange pêkoe and broken pêkoe being sold in Nilambur; the shopkeeper said, "people brought it round for sale." Now it is not likely that small hawkers bought these grades at factories. Mr. J. J. McKenzie complained in March 1909 that a chest of his orange pêkoe was found in London to contain nothing but shells, sand, and pieces of burnt wood. Mr. Waddington had a chest of tea accidentally broken while being slung on board in Calicut when it was found to have been partly emptied of tea, and filled with sand. Mr. Andrews, of Barwood Estate, told me he had been the victim of a more ingenious swindle, for he saw in London a chest of his tea that had been opened, part of the contents stolen and sand put in the middle of the remaining tea so as to escape detection till the chest was turned out. Other instances might be quoted. Messrs. Ferguson & Co. wrote in reply to a suggestion that Agents ought to be very careful in examining all chests sent for shipment, that these frauds are almost impossible to detect because the thieves are provided with solder, tea lead and other factory requisites, and carefully repair and weigh the chests, filling them with a sufficient quantity of sand to agree with the estate weights. It seems unlikely somehow that the work is done so skilfully as all that, and really careful examination would probably detect most thefts of this kind. At any rate, packing materials cannot be provided at many wayside houses between Wynaad and Calicut; and if the Police gave their minds to the business it would be scotched if not killed. The trouble ahead is that we do not know how extensive these thefts may be, or what complaints are being made to wholesale dealers in England. If the retailer finds many chests tampered with he may refuse to buy tea that has not been bulked in London. Thefts of tea in transit are not confined to Malabar. Complaints have been made from Assam, and no doubt from other parts of India. If we are going to ask for an Act to protect manufactured tea it should be made applicable to all India, and the Indian Tea Association ought to be asked to help us. Meanwhile I suggest starting a reward fund for the detection of these thefts. Such a fund was found useful even in the days of coffee. It would be worth our while to pay handsomely for the conviction of some of the receivers of stolen tea.

Planters' Benevolent Fund.—This fund is now established, and all members have been sent copies of the rules. It has not been supported as well as it deserves in Wynaad, only 6 members have subscribed.

The Meetings throughout the year have been well attended and I thank you all for the help you have given me in carrying on the work.

The accounts are now laid before you for examination and to be passed if found correct, and I tender my resignation.

(Signed) C. E. ABBOTT,
Honorary Secretary.

The report was adopted and ordered to be printed with the Proceedings. The accounts were passed.

1653. *System of Voting and Subscription.*—A statement was laid on the table showing what subscriptions will have to be paid under the rule passed in October. Mr. Mead proposed and Mr. Ewart seconded, that Messrs. Parker, Trollope and Abbott be appointed a committee to go through this statement and check it before the demands for subscription are sent out. —Carried.

1654. *Defaulters.*—Only 3 members are in arrears; it was decided to write off the amount due by one who has left the district, and the Honorary Secretary was instructed to write again to the second; a letter has been received stating that the third member's subscription will be paid.

1655. *Election of Honorary Secretary.*—Mr. Abbott was re-elected Honorary Secretary, and a vote of thanks was passed to him for his services during the past year.

(Signed.) ALFRED TROLLOPE,
Chairman.
(,,) C. E. ABBOTT,
Hon. Secretary.

ORDINARY GENERAL MEETING

was held on the same date, the same members being present.

Mr. Trollope in the Chair.

1656. *Proceeding of December's Meeting* were confirmed.

1657. *Tea Cess Committee. Bonus on Green Tea.*—Read letter from Mr. Romilly and Honorary Secretary's reply. Read U. P. A. S. I. circular 3/11 stating that Mr. Romilly has resigned his membership of the Tea Cess Committee and asking to have another gentleman nominated at once, as the meeting of the Committee takes place on February 17th.

Read also circular 4/11 quoting a letter from Mr. Gill, of Messrs. Harrisons & Crosfield, Ltd., New York. The Association nominated Mr. A. H. Mead, Manager, East Indian Tea & Produce Coy., as a member of the Tea Cess Committee; and in case Mr. Mead is unable to attend the meeting suggested the name of Mr. Frazer, of Surianelle.

1658. *Roads.*—Read letter to District Board Engineer about the diversion made at Noolpoya Bridge on Road 35 B, and his reply. Also letter to Mr. West and his reply.

Read letter from Mr. R. B. Wood, I. C. S., President, District Board, Malabar, to Honorary Secretary, and reply. The meeting thanked Mr. Wood for his letter, which the Association feels sure will lead to good results. Mr. Blake, District Board Engineer, spoke on the subject of the complaints that had been made, the steps that were being taken to remedy defects, and the difficulty the Department had with regard to labour. The Chairman thanked Mr. Blake on behalf of the Association for coming to the Meeting and for the information he had given.

1659. *Cattle Disease.*—Read letter from the Deputy Tahsildar informing the Association that anthrax has broken out in Kottapadi and Numoni.

1660. *Scientific Officer Fund.*—Read letter from Mr. Dickins, Honorary Secretary, Shevaroy Planters' Association, suggesting an assessment of 6 annas per cultivated acre for this fund and asking if Wynaad would join with the Shevaroy, Anamalai, and Nilgiri Associations in providing an Assistant to Mr. Anstead. Read Honorary Secretary's letter informing Mr. Dickins that this Association thought the subject should be

discussed at the next U. P. A. S. I. Meeting, by which time we shall know if we are in a position to increase our present subscription.

Note by Honorary Secretary.—It may be mentioned that if Mr. Dickins' proposal were carried out, Wynaad would have on its present acreage to pay to the Scienttific Officer Fund about Rs.4,500 a year.

1661 *Rubber Exhibition.*—Read circular U. P. A. S. I. 2/11. This Association is unable to contribute to the funds for the Exhibition.

1662. *Fugitive Offenders' Act.*—Read following letter from District Magistrate to Honorary Secretary, dated December 12th: " with reference to your letter of 22nd October last I have the honour to inform you that Section 19 (d) of the Indian Extradition Act XV of 1903 limits the application of the Fugitive Offenders' Act to cases of piracy, treason and any offence punishable under the Indian Penal code with rigorous imprisonment of one year or more; and that therefore a man charged with an offence under the Planters' 'Labour Act' cannot be arrested in Ceylon on a warrant issued by a Magistrate in British India." This is quite conclusive. Planters with Ceylon experience who were present at the Meeting said warrants are issued in Ceylon against Maistries and coolies absconding to British India, who can be arrested and brought back to Ceylon. But even if the law were altered to give similar facilities to Planters in India the expenses (which would have to be borne by the complainant) are so large that it is thought the Act would hardly ever be used.

A vote of thanks to the Chair terminated the proceedings.

(Signed) ALFRED TROLLOPE.
Chairman.

(„) C. E. ABBOTT,
Hon. Secretary.

Mundakayam Rubber Planters' Association.

The Annual General Meeting of the above Association was held at the Kutikal Bungalow on the 7th January 1911.

PRESENT.—Messrs. G. Atkins, R. Harley, J. J. Murphy, (Chairman), F. A. W. Neumann, A. C. Vincent, and J. R. Vincent, (Honorary Secretary).

Minutes.—The minutes of the last meeting were confirmed.

Accounts for the year.—Mr. Harley audited these, and on the proposal of Mr. Atkins, seconded by Mr. Harley, they were passed.

Secretary's Report on the Association's work for the year. The Honorary Secretary read this as follows :—

SECRETARY'S REPORT FOR THE YEAR ENDING DECEMBER 31st, 1910.

Mr. Chairman and Gentlemen,—As we have a long agenda to go through, and as our worthy Chairman is one of those hardworking gentlemen who likes to see work done and with the least possible amount of talk about it, I will be as brief as I can in reporting to you an account of my stewardship for the past year.

I see that one of the first things I had to do was to try and get Government to remove the Munsiff's Court from Palai to Peermade. A deputation was made to the Dewan and correspondence followed but without any tangible result so far, although the Dewan gave us some hope that our request would be acceded to.

The next item was the Rani road. This, I am sorry to say, Government very decidely refused to cut, pointing out that there was already a road going from Mundakayam *viâ* Kanjirapalli and Manimalay to the Quilon Railway. Mr. Richardson has been asked to bring this matter before Government, and doubtless will be able to do so at an early date.

Whilst on the subject of Roads I must ask you to thank the Government for sanctioning the tracing and lockspitting of the Kutikul-Poonyar road. This work is in progress and is practically completed, and estimates will be submitted in due course.

Representations were made to Government about the Lalam-Eruthupetta Roads and Bridges, and this is one of the items under the heading of roads that our Sri Mulam Delegate this year, Mr. Atkins, will mention at the popular assembly. I understand from Mr. Asher that nothing has been done to these roads in spite of my having persuaded the Kottayam Divisional Officer to himself go over and inspect them. The D. O. informed me that estimates had been submitted for two bridges, and that road repairs would be soon taken in hand.

With reference to the Kadamancolam road, I asked the Executive Engineer at Mr. Harley's request to come and inspect this. He did so, and made certain proposals which have been considered and about which we have written to Government. With Mr. Richardson's help it is hoped that a speedy settlement will be arrived at.

Mr. Asher has asked for a Telegraph Office to be established at Eruthupetta, and Government has been written to on the subject

Post Office.—On the Postmaster General passing through Mundakayam, I was fortunately enabled to see him on the subject of the removal of the P. O. from its present site to the 35th mile. The only Estate that does not benefit by the removal is Kutikul, but being a believer in " the greatest good for the greatest number" I did my best, with the result that the P. M. G. has promised to establish the Post Office at the 35th mile, and orders have been given to that effect. The removal will probably take place in about a month's time.

We now come, Gentlemen, to that hardy annual, the European Doctor Scheme. I am glad to be able to say that without exception all the Estates on the books of this Association have agreed to support the scheme. Messrs. Harley, Davy and Atkins will doubtless be able to let us know what progress has been made during the last three months, as they form the Committee deputed to work with the Peermade Committee on this subject.

Laboratory Fund, U. P. A. S. I.—The following Estates have not as yet subscribed to this: Teekoy, Kutikul, Rani, Cheruvally, Mundakayam Syndicate, Aneikolam and Kuppakayam. Four of these have not as yet subscribed as they await the decision of the Association *re* Local Scientific Officer, which subject I deal with later. The amount subscribed so far is Rs.135-0-6 of which Rs.112-8-6 has been sent to the U. P. A. S. I.

L. A. N. I.—Subscriptions to this to the amount of Rs.40 have been collected and sent to the Hon. Treasurer.

P. B. F.—The subscriptions paid in to this date equal Rs.595 and another Rs.200 have been promised but not paid yet. Mr. Murphy very kindly gave his Bangalore Delegate expenses to this fund. The amounts received have been forwarded to the U. P. A. S. I.

Association Subscription.—The only Estate yet to subscribe is Kuppakayam.

Rubber Thefts Act.—This was very kindly drawn up by Mr. Richardson for us, and it is being placed before our local Legislative Council as soon as possible.

Breach of Contract Act Amendments.—These have been put in the hands of Mr. Ananda Row, the Sircar Vakil, who is going to try and put them through the Council for us.

Liquor Licenses.—Government have very kindly promised that if the Association wish, two wholesale and retail licenses will be issued in 1086 M. E. in Mundakayam.

1911 Exhibition.—No subscriptions have so far been given towards this. Mr. Gudgeon, the Hon. Sec. of the M. C. R. P. A. wires me as follows:—"Hope you will support sister associations as regards 'subscriptions to Exhibition as you expect us to support your Scientific Officer Scheme.' Subscriptions paid to Exhibition Fund Rs.2,350 from this Association. All Estates paying 4 annas per acre bar one not yet received. Prosperous New Year to all.'"

Local Scientific Officer Scheme.—The only remark I wish to make with regard to this is about the question of subscribing to a private Laboratory Fund for this in preference to supporting the U. P. A. S. I. Fund. The point has been brought forward by several Estates and is well worth consideration.

Mr. Harley proposed and Mr. Atkins seconded the adoption of the report, and a vote of thanks to the Honorary Secretary for his services during the year. Carried unanimously.

Chairman's Address.—The Chairman gave the following address: Gentlemen:—I am sorry that so few members are present to-day. On the whole, however, the attendance at meetings during the year has been good.

Our energetic Honorary Secretary has reported very fully on the work of the year, and I do not propose to waste your time by going over the same ground. I congratulate you very sincerely on the present condition of affairs in the district. Pioneering troubles have been left behind, fields of waving illuc are a thing of the past and weeding as the chief estate work is at last giving place to tapping. At the moment I cannot give you crop figures but from experience gained on my own estate I can assure those of you who are only now commencing to tap that our trees yield excellently, that our rubber is of good quality and that the outlook for us all is very bright indeed. Even if rubber drops to 1*s*. 6*d*. per lb. the cheaply opened estates in this district will pay very fine profits.

Labour has been plentiful, and so long as we pay fair rates and look-after our coolies well, we need not worry much about competition from Ceylon and the Straits, particularly as it now seems certain that it is unnecessary to depend solely on Tamil Labour, as there is no difficulty in getting W. Coast coolies for the light work of tapping. The only drawback we suffer from is that though estates lose very little in advances we are unable to protect our headmen against defaulting sub-maistries, as there is no way of bringing the latter to book once they leave Travancore. Our Council Member, Mr. Richardson, has told us that extradition cannot be granted by the Travancore Durbar and that, if we apply to the Madras Government, we shall be told to accept Act 1 of 1903. I have heard and read so much in opposition to this Act that I would be sorry to press you to-day to accept it, but I think that it ought to be reconsidered by us at an early date.

The U. P. A. planting expert, Mr. Anstead, made two short visits to the district during the year. It is very evident that he has too much work to do and that stationed far away as he is he cannot in spite of his great keenness

and ability be of much help to us. We want a Scientific Officer to reside at a central place like Kottayam and devote all his time to Travancore and Cochin Districts. Such an officer, as you all know, is not merely required to look after diseases, from which fortunately we are very free. There are many problems connected with the cultivation of our estates and harvesting and curing of our produce which we cannot solve readily without scientific aid. You have an opportunity of discussing the matter later on this morning, so it is unnecessary for me to deal with it further at present.

Thanks to the energy shown by Mr. Richardson, a regulation for the prevention of rubber thefts will, I hope, soon be passed by the Travancore Government, but I am sorry to say that nothing has yet been done with regard to similar legislation in the Madras Presidency. The U. P. A. Secretary writes, however, that permission to introduce an Act will be obtained at the Council Meeting in February.

With reference to the telegram from Mr. Gudgeon whose good wishes for the New Year we heartily reciprocate, all estates in the districts have agreed to support the Rubber Exhibition, and I shall ask you to-day to instruct the Hon. Secretary to call up the promised subscriptions of 4 as per acre.

We have a long agenda to work through, so you must please excuse my making only a short address.

I think you all very much for the support you have given me during the year. My thanks are particularly due and are very willingly offered to the members of the Committee and to Mr. Vincent, who, as Hon. Secretary, has done such excellent work for the Association.

Mr. Neumann proposed and Mr. Atkins seconded, a vote of thanks to the Chairman for his interesting speech, and this was carried unanimously.

1911. Exhibition—It was resolved to call up the subscriptions to this fund at the rate of 4 annas per acrè, and the Secretary was asked to try and get in the subscriptions at an early date.

Laboratory Fund.—The Chairman stated that his instructions when going to the Bangalore meeting authorized him to promise subscriptions for this fund. He moved therefore, that those estates which had not already paid be now requested to do so. Carried unanimously.

Roads.—The Secretary reported that the lockspitting of the Kutikul-Poonyar road was nearing completion and that estimates for construction would soon be submitted to Government.

Read letter from Mr. Asher asking for the help of the Association with reference to the Lalam-Erruthupetta road. It was resolved that the Hon. Sec. be requested to write asking for further information from Government as to the progress of the road work and whether the two bridges sanctioned had been built.

Mundakayam-Rani Road.—It was proposed by the Secretary, and seconded by Mr. Harley, "That as the Rani Rubber Company are now constructing a cart road from Mundakayam to Vellanadi, reducing the total length required to be cut from Mundakayam to Rani by about 4 miles, Government be again approached and required to open this much needed outlet from this rubber district to Rani, giving access to the Quilon Railway."

Kutikul-Mundakayam Road.—The Hon. Sec. was requested to again communicate with Government with reference to the repairs to this road.

Kadamancolam-Kuppakaya Road.—The Honorary Secretary was asked to address a reminder to Government with reference to this.

Local Scientific Officer.—The Chairman proposed that the meeting go into Committee to discuss this. Afterwards, in open meeting, Mr. Atkins proposed and Mr. Harley seconded that Messrs. Murphy and Vincent be asked to meet the representatives of the other Associations concerned, and bring before them the recommendations of the meeting made whilst in Committee. This was carried unanimously.

Telegraph Office at Erruthupetta.—The Hon. Sec. read his letter to the Postmaster General and the meeting approved of the same.

Liquor Licenses.—The Association recorded a vote of thanks to Government for granting two wholesale and retail licenses for Mundakayam in 1087 M. E.

Breach of Contracts Act.—It was resolved that the Association approve of Mr. Richardson's action with regard to this, and thank him and Mr. Ananda Row for what they have done. It was proposed from the chair, that the Secretary obtain, and circulate amongst the members of the Association, copies of Act 1 of 1903, and that the Act be discussed at the next meeting with a view to the introduction of it in Travancore. Carried unanimously.

Work of the Legislative Council Member.—After a short speech by the Chairman, he proposed a hearty vote of thanks to Government for giving a seat in the council to a Planter and for their selection of Mr. Richardson, who, it was felt, was eminently suited for the honour. Carried unanimously.

The Association also recorded their appreciation of Mr. Richardson's services and extended their cordial thanks for all he had done on their behalf as council member.

Doctor Scheme.—Mr. Harley, representing the committee deputed to deal with this, reported that, as yet, no decision had been arrived at with regard to the housing of the Doctor. The committee were thanked for their services.

Mundakayam Apothecary.—The Association recorded their appreciation of the services of Mr. Subramania Iyer during the period he has been in medical charge in Mundakayam.

Sri Mulam Delegate.—The minutes of the committee appointing Mr. Atkins were read and confirmed. The subjects on which he was asked to address the Assembly are (1) Roads, (2) Removal of Munsiff's Court to Peermade.

Election of Officers.—The following gentlemen were elected as Officers for the coming year:—J. J. Murphy, Esq., Chairman, R. Harley, Esq., Vice-Chairman, F. H. Hall, Esq., Honorary Secretary, Messrs. Atkins, Davy, and Vincent, as Committee.

Date and Place of the next meeting.—Mr. Atkins very kindly offered his Bangalow (Vellanadi) for the next meeting, to be held on the first Saturday in March.

With a vote of thanks ts the Chair the meeting closed.

(Signed). J. J. MURPHY,
Chairman

(,,). FRED. H. HALL,
Honorary Secretary.

North Mysore Planters' Association.

Proceedings of the Quarterly General Meeting held at Balehonnur on January 9th, 1911.

PRESENT.—Messrs. C. P. Reed, (President), C. H. Browne, C. Danvers, R. G. Foster, C. S. Crawford, E. H. Young and A. F. Evetts. (Honorary Secretary). By Proxy.—Messrs. C. H. Trevor-Roper, S. L. Mathias, H. Pilkington, H. H. Stephenson and D. Mathias.

Dasara Delegate's Report.—Mr. C. W. Fowke's report was laid before the meeting and a vote of thanks was passed for having represented the Association at the Dusserah Representative Assembly.

Scientific Officer.—Proposed by Mr. C. Danvers and seconded by Mr. C. H. Browne :—" That in order to provide the funds necessary to secure efficient Scientific assistance, to contribute a suitable subscription to the U. P. A. S. I. and to carry on the work of the Association, the assessment payable by members from January 1st, 1911, shall be raised to 8 annas per acre on all cultivated land, whether Coffee, Tea, Rubber, Pepper, Cardamoms or any other product, subject to confirmation at the annual general meeting to be called in March next." Carried unanimously.

Proposed by Mr. R. G. Foster and seconded by Mr. C. S. Crawford : " That the Hon. Secretary do write a circular letter to each member of the Association asking him to attend the Annual General Meeting and pointing out that unless he does so in person or by proxy it will be assumed he agrees to the increased assessment." Carried unanimously.

Labour Difficulties—This Association has read with much interest the suggestion and resolutions passed at the S. M. P. A. meeting held at Chickanhally on the 10th and 11th November regarding Mr. Harris' scheme for establishing labour agencies in S. Canara.

Resolved :—" That this Association fully recognises the importance of the subject and the necessity of concerted action but is not prepared to endorse Mr. Harris' scheme out of hand, as it bristles with financial and technical difficulties. It is prepared to depute delegates to meet the S. M. P. A. in order to discuss the matter."

Excise.—Read correspondence with reference to the Adigebyle liquor shop.

Resolved :—" That this Association learns with satisfaction that the Yellimudloo toddy shop contractor has been punished for re-opening the shop that was abolished in the vicinity of Adigebyle."

Read Mr. C. Courpalais' letter and official correspondence in connection with the Kallahalla arrack shop, also the Honorary Secretary's reply to Mr. Courpalais, to which, at present, no answer has been received.

Read Mr. E. C. Kent's letter *re* gambling.

Resolved :—" That the Honorary Secretary do write to the Deputy Commissioner, Kadur District, asking him to take steps to stop the wholesale gambling of estate coolies, and others, in the public streets of Kalasa."

Roads.—Resolved :—" That the Honorary Secretary do write to the Executive Engineer, Kadur District, pointing out the unsatisfactory state of the Wastara-Koppa road from the 10th to the 25th milestone, which compares very unfavourably with the rest of road."

Service of Warrants.—Correspondence on the subject having been read, it was decided to go into the matter further before taking steps.

(Signed) A. F. EVETTS,
Honorary Secretary.

INDIAN TEA CESS COMMITTEE.

India Tea American Advertising Fund.

SEASON 1910-11.

REPORT FOR SECOND QUARTER.

I beg to submit my report covering July, August and September 1910.

NEWSPAPERS.

2. Advertising in newspapers has been continued on lines previously described.

As expenses in other directions are heavy and cannot be reduced until obligations to carry out certain forms of advertising are discharged, the newspaper work will have to be curtailed: though during this quarter several newspapers had, undei the system, to be taken up.

3. It is gratifying, though perhaps a little annoying also, to find that several large advertisers have recently adopted our system of newspaper work, which had heretofore been unique. This applies more particularly to the mention of grocers by name, and the very arrangement of these names under the names of smaller towns where the newspapers used to circulate.

SPECIALTY MEN.

4. Three men were employed during the whole quarter and a fourth man for half the period, but as each of the three regular men had two weeks vacation and, during the rest of the time found grocers more interested in the very excited and rising coffee market than in proposals to buy tea, the results are not so good as they have been in other quarters. Not only was the quantity of tea less, but the number of stores in which it was placed was less than in the previous quarter: but that quarter was, as noted at the time, especially favorable and the results in the quarter under review were quite good in themselves, and were actually better than the fourth quarter of last season. In any event the quantity of tea placed in each store was less than in the previous quarter. The figures were 563 stores bought 19,065 lbs. of tea, an average of a little over 33 lbs. per store against $48\frac{3}{4}$ in the first quarter.

5. As placing tea is only done for the purpose of being able to advertise where it is obtainable, the amount placed is in itself of no special importance. But as the mailing lists are based on the purchases made by retailers there will be a falling off to reckon with in the coming quarter.

DELIVERIES.

6. Deliveries were made in this quarter to 912 grocers amounting to 19,757 lbs. The excess number of stores compared to those shown by the specialty men's reports, being due to part of the deliveries being on account of the sales reported in the previous quarter, the quantity delivered agreeing with the quantity sold in the quarter is merely a coincidence. Deliveries are governed by the promptness of the Jobber, and only entire seasons are comparable.

POST CARDS AND SAMPLES.

7. There has again been an increase in the number both of post cards and samples dealt with, but I hope to see the volume of these diminish in the next two quarters. As mentioned in my last report we must reduce work in the various departments to keep within the limitation imposed by the funds available.

In this quarter there were mailed :—

In July ...	35,316 post Cards	14.562 Samples.	49.878 Total.
,, August ..	52.564 ,, ,,	17.574 ,,	70,138 ,,
,, September ...	30,002 ,, ,,	12.488 ,,	42,490 ,,
Total ..	117,882	44,624	162,506
Against in the first quarter..	112,773	35,562	148,335

8. The supply of post cards in Calcutta was exhausted in the previous quarter, but steps have now been taken to send out another supply, an order having been placed in London for 240,000.

FOLDERS.

9. The folders showing the cultivation and manufacture of tea in India, described in the last report, have been much appreciated. Six hundred thousand were printed; they are being carefully used and the supply in hand has not been exhausted, as we were able to satisfy some of our friends with rather smaller lots than they applied for at first. We have been asked for folders from points as far away as Alaska and California, but are unable to be as liberal as we would desire to be, and outside of the large number sent to New York and the Eastern States, try to confine their use to the territory we are covering in other ways; concentrated work is likely to be the most effective.

ICED TEA.

10. The experiment to place iced tea in competition with other "soft drinks" in street stands was continued throughout the hot season, corresponding closely with the quarter under review. While we got a considerable amount of advertising out of this trial the results were not satisfactory, inasmuch as the scheme could not be placed on a self-supporting basis. This is due mainly to the difficulty of distributing and maintaining supplies, the stands being widely scattered.

11. The plan adopted was to supply a cooler, or ice container, through which a coil conducts the tea to a tap. The tea was prepared and supplied ready for use in bottles of various sizes ranging from two to five gallons. These are inverted with their necks downwards so that their contents can be drawn out as required by the controlling tap. In practice we found that the coils have to be thoroughly cleaned out daily, otherwise the fresh tea becomes clouded with small particles of floating matter; due probably to impurities in the water. This gives it an undesirable appearance and checks sales. Although we tried a special motor delivery wagon, we found it impossible to visit each stand, clean the coolers, settle for sales, fill up with ice, etc., within the early morning hours when such work has to be completed; and in addition had a good deal of trouble with the motor truck. Many of the restaurants we supplied with tea and coolers the previous season were again our customers, and though some of these took from ten to fifteen gallons a day each, they alone could not support such a scheme.

12. It is now apparent that we must look to some method of handling the tea, which will admit of much quicker distribution and reduce the delay caused by attending to details.

13. The coolers we used are excellent for demonstrations, food shows and similar purposes, and there were several opportunities for using them this summer. The accompanying price list of groceries sold by a New York Department Store, has an illustration of their own tea department with one

of our coolers, as used by them all the summer. Such stores allow packet teas to make independent displays under certain conditions, and there is another illustration in the same list of a typical Packet Tea, both demonstrations which may interest the Committee.

14. During our experiment we tried paper cups, "sanitary and hygienic," at the street stands. They are intended to be used once and thrown away, and do away with the dirty and sloppy use of a few glasses for all comers.

GENERAL.

15. In a previous paragraph reference was made to the form of newspaper advertising we have evolved having been adopted by other advertisers.

A system of advertising Formosa tea has recently been introduced under the auspices of an Association which is supported financially and otherwise by the Japanese Government. It was stated at a meeting of the North Formosa Board of Trade that a subsidy of 30,000 Yen per annum for a period of seven years has been granted to the Japan-Formosa Tea Co.; that for the same period six per cent. interest is guaranteed by the Government on its Capital of 250,000 Yen; and that the Government experimental station at An Bing Ching, said to have cost the Government 150,000 Yen, has been handed over as a free gift. The system of advertising Formosa tea in this country (and I believe in England) partly follows some of our lines; but while the materials used are possibly more striking than ours, I am inclined to think that the system that has made our advertising a success is lacking. The show cards used are very finely executed lithographs and there is a large selection of post cards, all made in Japan; and while I think it attractive, I do not think it can be very effective owing to the want of a proper system for reaching the key to all demand—the consumer.

16. During the last four seasons the imports of Formosa Oolong into the United States has been steady; under seventeen million lbs. per annum. It has not fluctuated very much in twenty years, the range being from fifteen to twenty million pounds in that period. The importers find that the market for this tea is feeling the influence of the importations of India and Ceylon teas, as there is a strong tendency to blend these with oolongs and thus, in effect, educate the public taste towards heavier bodied tea. This is one of the reasons for the activity now shown, and it is stated that efforts will simultaneously be made to increase the output and to improve the demand here, in England and in Russia. The better grades of Oolong tea are expensive compared with other teas and there is at present practically no market for any quantity outside of North America.

17. This activity on behalf of tea has not the unanimous approval of the trade in this country. It is realised that the entire control of the market will ultimately pass into the hands of the Japanese, probably into those of one strong company, and that European and American firms will be displaced. Such a company with its own distributing house in America will have no competitor and will be able to fix its own selling price.

18. In this connection I quote from Brooke Bond & Co.'s Tea Circular of June last:—

"The Government standard quality for India and Ceylon tea permitted for home consumption in the United States has recently been raised. The standard fixed now is good common tea. It is rumoured that the change has been brought about by the influence of persons interested in China tea with a view to discouraging its rival. Whether the effect will be quite what the promoters desire is open to doubt, especially as the people

of the States are rapidly becoming educated in the use of Indian and Ceylon tea. By the raising of the standard there will be no poor Indian or Ceylon tea sold in the States, and as a consequence, low grades of China tea will compare even less favourably than in the past. In a wealthy community such as the United States where price is not altogether the governing factor, it would see to be almost axiomatic that the better article will ultimately secure the popular favour. The relative position now between British grown and China tea in that country is much the same as it was in the United Kingdom twenty years ago. There China tea has been superesded by its rival.

"The same growth in the consumption of India and Ceylon tea will take place in the United States, but with this difference; it will come quicker because it is helped by enemies as well as friends."

19. I may add that, so far as China black tea is concerned, there is but little rivalry now. Such tea is selling to-day at under ten cents. a pound against India and Ceylon at sixteen cents., yet but little goes into consumption, and I understand that there is some being bought with a view of shipment to London, where, it is anticipated, the high price of India and Ceylon's will create an outlet for cheap China black tea.

20. During part of this quarter I was in England, where I placed the order for post cards already alluded to. While there I observed some of the Formosa show cards displayed in shops in a small country town, but did not make inquiries as no doubt you are fully informed on the subject by the London Committee.

(Signed) R. BLECHYNDEN.

The imports of tea into Switzerland in 1909 amounted to £57,500, the net weight thereof being 414 tons. H. B. M. Vice-Consul reports:—This is an increase in quantity of 14 tons and in value of £2,000 on the imports of 1908, China tea still appears to be more popular in this country than Indian tea. In 1909 the imports of the former amounted to 233 tons, as against 165 tons from British India

It may be mentioned that parcels of tea weighing less than 5 kilos. (11 lbs.) gross weight, are subject to the higher duty of 40 fr. per 100 kilos., whereas all parcels exceeding 5 kilos. in weight pay only a duty of 25 fr. per 100 kilos.

The following remarks about Coffee, from the *Produce Markets' Review*, are deserving of attention:—

The quality of the Costa Rica and Colombian was quite equal to the average of the early shipments, but the Guatemala indicated that it had been hurriedly prepared for market, and possibly picked before it had become fully ripe. It is a mistake, in nine years out of ten, for planters to hurry their consignments in order to obtain the high prices that are often paid for early shipments. These high prices can only be obtained when the quality is sufficiently good to warrant them, as the Coffee is usually wanted to freshen up and improve old crop parcels which, though good and strong, have become rather flat in liquor, and the new crop should add the necessary acidity and briskness. . . .

The reports are not encouraging about East Indian either as to quantity, or quality, while it is reported that many Neilgherry marks have been sold direct to the Continent.

SELECTED CUTTINGS.

The Maintenance of Soil Productivity.

In most parts of the world, agricultural practice has reached the stage of full recognition, in individual cases, of the necessity of keeping up the fertility of the soil by approved methods. An understanding of the needs of the soil has been gained, so that there is a decreasing tendency to take whatever this may yield, without treating it in ways which will prevent its exhaustion. This phase of the methods of agricultural production is naturally of the greatest importance, especially as it enables the area concerned in that production to be conserved effectively.

The principles of the maintenance of soil productivity are, however, usually employed in a narrow way only. They are considered to relate to matters on a particular estate, or group of estates, or to the production of one given crop This is insufficient where the agricultural welfare of a whole district, or colony, is concerned. Such welfare depends mainly on the level of the agricultural efficiency of the inhabitants, and therefore on the extent to which agricultural methods suited to the particular conditions are in vogue. Individual effort may be of use in limited areas, but in countries where the means of production are generally inferior, those areas, alone, will profit by it, and the very existence of this inferiority will increase the difficulty of the effort, and lessen the value of its results.

This matter possesses a special importance in regard to districts or colonies which have become noted for a particularly high grade of some definite commodity, because of the large area from which this comes, and on account of the speedy deterioration, and consequent reproach, that it will suffer in the event of its production under less favourable circumstances. A reason is thus given for the exercise of the greatest care to prevent negligence in the course of this production, and thus to ensure that the soil, in which the plants grow that yield the commodity, shall not be made to furnish this in amounts too great for its capacity, or be permitted to undergo exhaustion on account of neglect. Once such untoward circumstances are allowed to come into being, the efforts of individuals to remedy matters are of little use. There is need for a wide consideration of affairs, and the adopti on of methods which will improve agricultural conditions in a perfectly general way.

Wherever there is a low level of agricultural production, owing chiefly to the lack of a proper general procedure in relation to it, conditions are rendered doubly unfavourable because of the want of means to attract capital. In such cases, indeed, the usual effect is one of actual repulsion, and it is unlikely that outside money will be available, for helping in the amelioration of conditions, unless there is evidence of the possibility of the adoption of measures which will lead to a general improvement of the circumstances surrounding and limiting agricultural production.

Means have therefore to be found which will prevent deterioration, where this is likely to take place ; as well as to arrest it, where it is already known to be in evidence. The tendency, as a matter of fact, should be always toward improvement, for in no case has perfection been attained, and the conscious striving toward this will have its effect in regulating any inclination toward lessened efficiency. These means are sufficiently obvious and include those of special, as well as of a more general, application.

The more special methods toward attaining what may be termed agricultural conservancy have relation to such matters as the prevention of the loss of soil by washing during heavy rains, and in other ways, as

well as that of the permanent lessening of the amount of the more readily available plant food in it. In the latter connection, the more general employment of the rotation of crops, green dressings and artificial manures, is indicated as a natural remedy. In addition, there is keeping of stock in quantities adequate to maintain the proper relation between the vegetable produce of the estates, the energy required on these, the maintenance of the proper state of fertility of the soil, and the food-supply of the inhabitants. The far-reaching importance of the raising of a sufficient amount of stock in a country is not often realized, and the provision of means to do this is a difficult problem where the crops are chiefly of a permanent nature.

The general means toward the end that is being discussed have reference, like the special ones, firstly, to the prevention of the washing away of soil at times of heavy rainfall. They are thus made to include reafforestation, a subject whose importance does not require any argument. A second matter, broad in its application, is the greater use of waste substances as manures. Many such products, of large value in the aggregate, are thrown away or destroyed, when they could be utilized as stated, even if this entailed a certain amount of preliminary preparation. The case of the exportation of edible products, particularly when these are by-products, is somewhat similar, as the price obtained for them is often not fairly representative of their value as foods for stock; the connection of their greater use in reference to increased stock-raising is obvious.

The consideration of the general means toward the maintenance of soil fertility includes, however, a matter that is becoming of greater importance as time goes on, namely, the question of diversified agriculture. This is too large a subject, in its various connections, to treat here adequately. It is evident, however, that in relation to what may be termed the agricultural balance of a country, there is a certain distribution of the crops over the land available for them, that is, the most effective in regard to the general economy of production. It would be difficult, to express it shortly, to know when the distribution that is most efficient has been obtained, but much can be done toward its attainment by increasing the number of kinds of crops grown. One result of this diversification of crops will be to afford a certain amount of relief to the strain of production by the soil, as well as to give the best chance of the mutual provision of many of the materials that are required in the raising of the different products.

The mention of the most obvious general means toward the conservation of the resources that are contained in the soil has been left until the last. It is sufficiently self-evident that this means is included in education. Much has been done in the past to elucidate the best methods in connection with this, and the investigation can be said to have passed the experimental stage. It now remains to extend the practical application of its results, so that, with the spread of agricultural knowledge, there will be brought about a greater respect for the soil as a producer, and a better appreciation of the inter-dependence of the factors that limit production.

All the different phases of agricultural production, in a given community, react on one another, and the state of the general efficiency has a limiting effect on the progress of any one of them. This is because this state of efficiency does much to regulate the extent to which the fertility of the soil is maintained. The prosperity of such a community, therefore, depends on the value of its inhabitants as agricultural workers, so that, if this is to be maintained or increased. there must be a wide recognition of the necessity for general effort toward improvement.—*Agricultural News.*

The Planters' Chronicle.

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(INCORPORATED.)

The Scientific Officer.

Mr. Anstead expects to be back at headquarters on the 3rd proximo, and is likely to proceed about the 5th or 6th idem to Hunsur, to inspect coffee-curing operations, returning to Bangalore about the 8th or 9th idem. He will then remain at headquarters till about the end of February.

The International Rubber Exhibition, 1911.

In a letter dated the 30th ultimo the Manager of the above Exhibition writes to the Secretary, U. P. A. S. I :—

"At the last International Rubber Exhibition we were able, through the kind co-operation of various Governments, Exhibition Committees and Planters' Association, to bring together a number of highly interesting articles relating to Rubber Countries, which served the two-fold purpose of advertising the country of their origin and of increasing the attractiveness of the Exhibition itself.

"*Rubber Stumps, &c.*—I am now writing to ask if it would be possible for your Association kindly to help us in this way. My Committee would greatly appreciate the loan of Rubber Stumps (showing principles of tapping in vogue in your country, tapping marks, &c.,) and any other indigenous trees which could be used for special decorating purposes. Curios of all kinds connected with Rubber Countries would also be welcomed. Should you be able to afford us this assistance, no doubt the articles could be forwarded with your exhibit.

"*Your Stand.*—For your Stand, general photographs showing the nature of the country, together with descriptive literature, should form a perminent feature. I would also take this opportunity of reminding you that exhibits should reach this Exhibition, at the Royal Agricultural Hall, London, N., on the 15th June. It is always advisable to be well in advance owing to unforeseen delays. I cannot lay too much strees upon the necessity of having all arrangements made early in relation to your printing and the erection of your Stands, as, 1911 being Coronation Year, prices are bound to advance if these matters are left to the very last."

As exhibits will have to be grouped and arranged after arrival in London, it is desirable that they should be sent to Messrs. Peirce, Leslie & Co., Ltd., Calicut, not later than the end of March next.

Probably there are some retired planters in England who possess sporting trophies and curios of sorts, which they might be willing to lend for use during the Exhibition. Friends in India and elsewhere are requested to bring this matter to the notice of such gentlemen.

Scientific Officer's Papers.

LIII.—The Proposed Government Experiment Plot.

At a meeting of the Nilgiri Planters' Association held on 23rd September 1910, the following Resolution was passed: "That a request be made to Government through the Collector to grant a piece of land at a suitable elevation, between 3,000 and 4,000 feet, for experimental purposes under the advice of the Planting Expert, for the Hybridisation of Coffee and Rubber and for proving what products may be successfully grown by planters in this District."

It was understood such an Experiment Plot would be in the charge of and controlled by the Curator of Government Gardens, who would work in co-operation and consulation with the Planting Expert.

The request has received most sympathetic treatment at the hands of the Collector, and a site for the plot has been chosen by Mr. Rhodes James and has been inspected by him, the Collector, Mr. Butcher, and Mr. Raman Menon on behalf of the Forest Department.

On 12th January, in company with Mr. Butcher, the Acting Curator in charge of the Government Botanic Gardens and Parks, the Nilgiris, I visited and inspected this site. The land chosen appears to me very suitable for the purpose for which it is required. It is very easy of access, which is a great point in its favour, being near Coonoor and only about two miles from Runnymede Station. It is just below the 16th milestone on the new Metupalayam Ghaut road and is bounded by the road and railway at the top. The land is somewhat steep, but not too steep for coffee, being very similar to Mr. Rhodes James' estate which is practically in boundary with it. At present it is in jungle and dense undergrowth. The soil appears to be good, and there is a good layer of humus on the surface. The most suitable place to commence operations appears to me to be at a point at the bottom of the valley near the river, as it is essential to have water close by to water nurseries and to conduct spraying operations should they prove necessary, as they probably will, as it can hardly be expected that the Coffee will escape an attack of Green Bug at first. Here the elevation is somewhat between 3,500 and 4,000 feet.

I have no exact information as to the rainfall but it is probably in the neighbourhood of 80 inches.

In the first instance it will not be necessary to clear more than about two acres, and the big trees will be left for shade purposes, but some five acres are available.

The land has not yet been granted by the Government and we have no guarantee that it will be granted, but it is to be ardently hoped that it will, and I trust that the Nilgiri Planters' Association will do everything in their power to press the matter. It is of the utmost importance, and it is necessary that such work should be undertaken by the Government to ensure continuity of purpose. The work must necessarily extend over a long period of time, and the average planter cannot undertake it. Estates change hands, owners die, or are absent for long periods, and consequently the results of valuable experiments are apt to be lost owing to change of plan, neglect or abandonment.

Moreover hybridisation work is unfamiliar to the average planter and can be much more efficiently done by a trained man such as the Curator of the Government Gardens.

It is much to be hoped that the land will be granted and work begun as soon as possible on the attempt to produce a variety of Coffee which is disease-resistant.

RUDOLPH D. ANSTEAD, *Planting Expert.*

Notes and Comments by the Scientific Officer.

95. *Be Ready!*—A short time ago I was looking through some old files and came across a lecture to Ceylon planters by the Government Entomologist. The cap fits some South Indian planters so exactly that I cannot resist reproducing the following extract:—

"I wish particularly to draw your attention to the importance of being prepared for any emergency, such as the sudden appearance of a dangerous pest. How many of you possess even a single spraying machine—or a powder-distributer, or any stock of even the simplest insecticide? If there is a sprayer, it is probably poked away in some out-of-the-way corner and never looked at. If suddenly required, it is found that the valves have gone wrong, or the rubber tubing has perished, and it has to be sent to Colombo for repair just when it is most urgently needed! The machine when not in constant use, should have clean water pumped through it at least once a fortnight, and, after use with any insecticide, it should be carefully washed out with (preferably warm) water before being put away. The machine might be kept in order by using it for watering the ferns or flower beds, when not required for more serious work. Every single estate should possess at least one good sprayer and a powder-distributer. Then at times of any serious local outbreak co-operative measures could be quickly undertaken.

"Then a supply of some of the simpler insecticides should be kept on every estate, ready for an emergency, just as medicines are kept for cases of sudden sickness amongst your coolies. Every estate has its supply of such simple drugs as chlorodyne, santonine, quinine, &c. Why should you not be equally prepared with kerosine emulsion, sulphur, Bordeaux Mixture, and arsenical preparations, against diseases of your plants? What is usually the course when an insect pest shows itself? To begin with, it has probably been on the place for some time before it has been observed; another three or four days go by while specimens are being forwarded to the Government Entomologist and his reply and recommendations received. Then, if any special treatment is required, it is as likely as not that an order has to be despatched to Colombo for the necessary material, resulting in a loss of another week before action is taken when every day at the commencement of an attack is of the utmost importance. In dealing with insect pests, the proverbial "stitch in time" will save not only 9 but 999. and make indeed the difference between success and failure. The early observation of any pest is a point that should be attended to. Encourage your coolies and kanganies to report (and bring specimens of) any insect found upon the tea. Presume that every such insect is an enemy until you have assured yourselves that it is harmless."

RUDOLPH D. ANSTEAD,
Planting Expert.

COFFEE IN MEXICO.

H. M. Consul-General at Mexico City (Mr. C. E. W. Stringer) reports that the coffee crop in Mexico this season is estimated at 20,716 metric tons, as compared with 22,609 metric tons in 1909-10.

NOTICE.

The Madras Agricultural Calendar will be published by the end of March 1911, for the official year 1911-12.

COFFEE.

Two Different Methods of Cultivating Coffee.

Mr. J. Hirst, Agricultural Instructor, writes in the *Journal of the Jamaica Agricultural Society* :—

Which is the better system of cultivating coffee—long top or short top?

This is a frequent question at agricultural meetings, and has many times been the cause of long and sometimes heated arguments. So long as coffee continues to be cultivated, I have no doubt it will still remain a point of difference and argument among coffee planters.

I do not propose to write a treatise in favour of one system or the other; but to show the different principles underlying each method, and that each has its merits under certain circumstances when carried out on right lines and with due knowledge and regard of the principles governing it.

I shall also try to point out what I consider to be the chief points of misunderstanding, and the mistakes commonly made in cultivating under each system.

Distance apart.—First of all is the distance apart at which the plants are set under each system.

It is, I think, commonly accepted in Jamaica, that long-top coffee should be planted closer than short-top coffee, because as it is said "it goes up." This I consider a great mistake, and is proved by experience. It does "go up," and usually bends over at the top, thereby excluding light and air and causing the loss of many branches and the non-fruiting of others.

In Mexico, where in different localities both systems are practised very successfully, the long-top is invariably planted wider than the short-top. The usual distance for long-top is twelve feet apart. It is usually grown with three or more stems, which "go up" and are weighted down with crop, and having the necessary space and soil area to support them, assume the habit of a weeping willow tree and are loaded with berries throughout the tree. Even at what we should consider such a wide distance, it is often difficult to walk between the trees, and the crops are such as I have never seen in Jamaica.

In growing long-top coffee it is well to follow this system of having three stems or suckers from the stem (not three individual roots) and with sufficient room it will grow to a considerable height with strong stem and primaries and bend over, making a large tree with a great amount on bearing wood.

Planted at close distances it will go up to long switches, with a few small branches and fewer small berries up at the top, plenty of dry firewood, but no coffee.

I suggest that it should be planted here at distances varying from eight feet to twelve feet, according to soil and climate.

Pruning.—Next we must consider the difference in pruning; and here I may say that under both systems pruning is required, and I may quote an extract I came across some time ago from "Notes on the Cultivation of the Coffee Plant," by Nicholas Saenz, Professor of Natural Science at the National University of Colombia :

"In some countries pruning is practised, in others not. Both parties have arguments for and against each system; in most places, however, there is a marked tendency towards the practice of pruning. It is done in Andimarca, Solima, and Boyaca, as well as in the British West Indies,

Arabia, etc ; indeed in most places where fine coffee is produced ; and I very much doubt whether any planter in possession of any good soil, and who has been accustomed to prune, would be inclined to adopt the free growth system."

There is, however, a difference in the main principle governing the pruning on short-top and long-top coffee. First of all we must remember the fact that a primary branch, once destroyed never grows again, whereas the secondary and tertiary branches if destroyed, will be renewed.

For the benefit of those not well acquainted with coffee pruning I may explain that a primary branch is that springing direct from the stem or trunk of the tree. A secondary branch is one springing from this first or primary branch. A tertiary branch is one springing from a secondary branch.

Short Top.—In exposed and windy situations, short-top coffee will always be grown ; as being lower it is less subject to wind damage.

Now apart from the above consideration, the main object of topping a coffee tree is to strengthen the primaries ; and cause it to send out secondary and later tertiary branches, on which the coffee is borne.

Under this system the primaries become thick and strong, and support a large number of secondary branches bearing coffee. When these branches become injured, or decayed by overbearing or other causes, they can be pruned off, when new ones will be formed to keep the tree in full bearing. A common system is to take off the alternate secondaries, with two objects : first, so that there may be a constant renewal of bearing wood on the tree ; second, to allow greater room for the extension of tertiary branches.

Now it will be readily seen that by topping the tree we place it under artificial conditions ; and to keep it in good bearing we must keep up those artificial conditions by constant regular, and thorough pruning, suckering and opening. Neglect of this is fatal, and here is one of the many reasons why short-top coffee does not thrive in certain districts. The people do not understand its proper care and pruning, or will not take the trouble to do it. Consequently the tree becomes choked, decays and dies out.

Long Top.—Now the tendency of the untopped or long-top coffee is quite different. It grows upward, and consequently the sap is not directed to so great an extent as in the short-top coffee, into the primaries, which do not grow so short and powerful, and do not exhibit the same tendency to send out secondary branches. The coffee berries are borne mainly on the primary branches, and consequently we have to prevent the decay of these branches by allowing them sufficient room, light and air ; and occasionally when from overbearing, they become decayed, they have to be shortened when they will usually recover, and perhaps send out secondary branches to take the place of what is lost.

In the short-top coffee we allow no suckers to grow, excepting when the whole tree becomes decayed and it is necessary to renew the tree by a new growth of a certain amount of new suckers to replace those stems, or parts of the stems, on which the primaries have become decayed from overbearing and other causes.

Directly we see one of the stems becoming unfruitful, weak, or losing a number of its primary branches, we should allow a sucker to come up to take its place, when the decayed stem is cut away, by which means the remainder become strong and healthy, with their full complement of branches.

A common mistake, however, is to allow a mass of suckers to grow up together, when they grow weak and whippy, lose the greater portion of their branches, and become useless. At an early stage all but the required number of suckers should be cut away, thus renewing the tree and keeping it in constant bearing.

The real objections to long-top coffee are that from planting too close, neglect, and lack of attention to the above details it becomes switchy, loses its branches, is no longer fruitful, and bears only small berries. Its cultivator usually has an equal objection to short-top coffee, because from his lack of attention and knowledge of its proper handling, it assumes the same form.

Properly planted, properly cultivated, and properly handled, long-top coffee can bear equally good crops of good coffee as short-top.

Whether it is that short-top coffee is more generally cultivated at the higher elevations, whilst long-top coffee is more general at the lower or not, but the fact will, I think, be generally admitted, that short-top coffee gives a bean of better colour and aroma than does long-top coffee.

I am, however, more inclined to think that this is due to elevation and the fact that, in Jamaica at any rate, short-top coffee is an estate cultivation, whilst long-top coffee is a small settler's cultivation.

Where the proper handling of short-top coffee is not properly understood, or where from any cause the people are not prepared to carry it out in its entirety, the long-top method will be the best for our small settlers.

Summary.—Short-top coffee has one stem, and a limited number of primaries, with a considerable number of secondaries and tertiaries on which the coffee is borne. The object in pruning is to preserve the primaries which if destroyed lessen the bearing surface of the tree, encourage the growth of secondaries and tertiaries, and to destroy gormandizers and suckers.

Long-top coffee has a greater number of stems and primaries, on the latter of which the coffee is principally borne. The object in pruning is chiefly to cut away dead, decayed and exhausted wood, and to replace these by a growth of suckers.

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Coffee in 1910.

Developments in this market during the season have been more satisfactory than proved the case with its predecessor—that is, from a seller's point of view. After starting at slightly weaker prices, affairs in general steadied up, until the latter half of the year witnessed quite unexpected strength, the outcome of the smaller Brazilian weather crops and weather conditions being reported as not altogether satisfactory for the next gathering. This put an entirely different complexion upon affairs, and prices in the terminal market, and also for all kinds of Brazilian, being driven up rapidly, naturally reflected to other descriptions, and closing rates are about 15*s.* to 20*s.* per cwt. dearer. The East India crop proved of very poor quality, in point of fact, almost a record in this particular respect, but that of Costa Rica left little to be desired. From Colombia several very fine parcels were received, pointing to the art of curing and treatment there having improved vastly. Taking the crops in bulk, however, there was an undoubted scarcity of bold sizes, which whenever offered did not fail to reach high prices, while the lower qualities which formed the bulk of supply later in the season, were disposed of only at declining values, undesirable sorts being difficult to sell even at the reduction. The export trade was also quiet in the earlier part of the year, and helped to give the market a depressed tone. The Brazil crop for the season 1909-10 amounted to 14,944,000 bags, against 12,419,000 bags in 1908-9, and 10,304,000 bags 1907-8. The crop now being marketed in Brazil is a much smaller one than its predecessor, and a material change over the general position in the latter half of the year. Speculation, which has been dead for a number of years, has revived and the present upward movement bears some resemblance to the remarkable boom of 1886-88, although the causes are different. Then speculation was

the primary cause of the rise, but the advance now is caused largely by increased consumption.

Buyers in the chief consuming countries, long accustomed to big supplies, allowed their stocks to run down to a very low level, and when the time arrived that reduced crops and depleted visible supplies became strong factors in the situation, the increased demand caused prices to rapidly advance. The rise has also been assisted by the extraordinary advance in the Brazilian state of exchange, which stood at $15\frac{1}{4}d.$ in the early part of the year, and was up to $18\frac{3}{8}d.$ in September, since falling to $16\frac{5}{16}d.$ The rise and fall in exchange caused great fluctuation in the terminal market, but the subsequent fall was more than counterbalanced by the higher quotations from Brazil, which ultimately buyers will probably have to pay, as Santos exporters are having matters much their own way, and a very extensive business has been going on in that terminal market. Crop reports have been very conflicting, but it is now believed that the present crop of Rio will equal $2\frac{1}{2}$ million bags and that of Santos 8 million bags. The next Rio crop is estimated at nearly 3 million bags, and that of Santos may approach 11 million bags. The outlook is not so good as at one time promised, and while a big crop is now out of the question, it is hoped that the yield will ultimately prove of average extent. Spot prices in Europe are much below those ruling in Santos, where the market has recently been very active and advancing. At the higher prices ruling consumption is going on less favourably in many countries, and should present rates continue a reduction in the volume of business is to be anticipated. Deliveries for home use in this country in the first eleven months of 1910 were 248,051 cwts. against 251,427 cwts. in the corresponding period of 1909, and 249,758 cwts. in 1908. The increased competition of Tea and the stiffer rates ruling for Coffee may be accountable for the reduction. The imports of Coffee in the first eleven months of the past year totalled 893,476 cwts. against 712,845 cwts. in 1909, and 739,794 cwts. in 1909. Exports were large—708,863 cwts. against 534,794 cwts. in 1909 and 421,780 cwts. in 1908. Only small quantities of the new crop mild descriptions have come to hand, and have found a ready market especially for bold sizes, which have realised long prices. Prospects for the new crop of Costa Rica are for an outturn similar to last season Prices will rule higher than last year, but the finer qualities have not advanced so much in proportion to the lower grades. The quality of Guatemala is barely up to last year's standard, and the crop is larger than last year. The Salvador crop is larger, but that of Venezuela is smaller. Very little mild coffee is to be had below 60*s*., and grades from that figure to 70*s*. are comparatively much cheaper than low Santos, there being only a margin of a few shillings instead of about 20*s*. Visible supplies at the beginning of December were 14,740,000 bags against 17,550,000 bags in 1909, and 16,322,000 bags in 1908.—*The Grocer.*

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Brazilian Crop Estimates.

In their report dated 30th December 1910 Messrs. G. Duuring & Zoon, of Rotterdam, remark :—

"The *Rio* crop is estimated at 2,500,000 bags, leaving 795,000 bags to be received, as against 1,004,000 bags in 1910, 1,048,000 bags in 1909, 1,462,000 bags in 1908 and 1,653,000 bags in 1907. Next crop is estimated at 3 million bags.

"The *Santos* crop, estimated at 8,000,000 bags, including Minas, is leaving 809,000 bags to be received, as against 1,081,000 bags in 1910, 2,031,000 bags in 1909, 1,728,000 bags in 1908 and 5,861,000 bags in 1907. Next crop is being estimated at $10\frac{1}{2}$ to 11 million bags."

SELECTED CUTTINGS.

Fungus Notes.

THE CHIEF GROUPS OF FUNGI.

PART I.

The following series of articles is, observe the *Agricultural News* (from which we take these cuttings), intended to give a short account of the chief groups of fungi, and of the characters (both those as seen by the naked eye and those as viewed under the microscope) by means of which they are separated from one another. Any points of interest that occur in the life-cycle of members of the different groups wiil also be described. . . . It is hoped that they will be of general interest and also of assistance to those taking the Courses of Reading, as helping to throw light on the true nature of a fungus, on the different forms under which these plants may appear, and on the various types of injury they may inflict upon the higher plants. The groups will be taken in the order of the relative complexity of their reproductive arrangements; the simplest forms being treated first and the more complex ones later, particularly as this is considered to be the order of their evolutionary development. They will be dealt with broadly, and no reference will be made to the characters separating families, genera, or species, as this would prevent the subject from being treated in a sufficiently simple manner. Typical fungi illustrating the characters of any group will be selected as far as possible from those well known in the West Indies, either as causing diseases of crops with which many are acquainted, or as being of some economic usefulness to the planter, for example, the fungus parasites of insects.

Before turning to the fungi themselves, it may be of assistance if some idea is given of what is understood by the words species, genera, natural order and cohort.

The starting point for all systems of classification of any description of objects is always the individual. Thus, among plants, the first thing noticed is always a collection of individuals, each of which differs from the other to a greater or less extent. On further careful examination, it becomes clear that some of these plants resemble each other more than any other of the plants examined. Such a group of plants is known as a Species. It now becomes necessary to consider on what ground this resemblance is based. On looking at one plant, it may become clear that it is somewhat similar to individuals of another kind, in the way that the Hibiscus resembles the cotton plant. The question is: In what ways is this similar to the cotton plant? Careful examination shows that, though the flowers are of a different colour, yet each has the same number of petals, and the other parts of the flower are alike in each, and of the same number in each. Further, both plants are of a bushy habit, although the leaves are different. Thus on the sum of various characters exhibited by each, there are more points of resemblance than of difference, and consequently the plants may be said to be related to one another fairly closely. The resemblance is somewhat similar to that often shown between the different members of the same family in the human race. The idea underlying a natural system of classification is to bring together into the same species those plants which are related in the same way as the various members of a human family are related, all of whom had the same ancestors. In speaking of human relationships, it is often said that the members of a certain family have one, or possibly two, features that are characteristic, as for example the eyes, the mouth, or even the voice. In considering plants, it is

often found that two plants whose general appearance is very different have flowers and fruits that are very similar.

As in observing the relationships of human beings, greater importance is often attached to similarity of eyes and voices or any two similar features than to the numerous dissimilarities, so in the case of plants greater importance is often attached to similarities in the flowers and fruit than to dissimilarities of general habit. With plants, this may be done without involving much danger of classing together those which are not really related, for a reason that may be given as follows: The flowers and fruit of a plant are its reproductive organs, and consequently are not engaged in obtaining food for the plant. Now, while the conditions of temperature, moisture, food supply and so on, under which a plant lives, may have a very considerable effect on those parts that are concerned with obtaining its food, they will not have so immediate an effect on its reproductive organs.

Consequently, plants which are fairly closely related may show very considerable differences in their vegetative parts, that is in the parts engaged in obtaining their food, while they still exhibit a very close resemblance in their reproductive parts. As a result of this, the classification of all plants rests mainly on the characters of those organs by which they reproduce themselves.

To return to the definition of species, it is now evident that a group of plants which resemble one another more closely in the sum of their characters, more especially those of their reproductive organs, more than any one of them resembles any other plant in these characters, may be said to form a species.

Similarly, any group of species, each of which resembles the others more closely than it does any other species, forms a Genus; and similar groups of general form a Natural Order or Family. Groups of similar families form Cohorts, which are the main subdivisions of the great primary divisions of the plant kingdom.

In the case of the fungi, just as has been shown for flowering plants, the characters of the reproductive organs are those on which the classification is most especially based, as in many cases the mycelia, or vegetative parts, even of widely different groups, are so similar as to be almost indistinguishable.

Broadly speaking, there are two different types of reproduction in the fungi. In the first, a special portion of the plant body is prepared and separated off for the purpose of increasing the numbers of the plant. Such a portion is known as a conidium, or spore, and is capable of germinating again very quickly, if it is placed under conditions suitable to the growth of the fungus, such as a sufficient and acceptable food supply, plenty of moisture and a suitable temperature. Such spores are merely parts of the plants from which they were cut off, and the plants that grow from them resemble the parent in all respects. As has been pointed out before, these spores are produced in immense quantities when all the external conditions are suitable to the fungus, and are those to which an epidemic of any disease is due. Fungi belonging to very different species, or even genera, may produce spores of this kind, which are very similar in appearance, consequently such spores are mainly of secondary importance in classification.

Nearly all the groups of fungi also produce another type of spore; this is usually formed by means of a sexual process, and is especially adapted for tiding over unfavourable circumstances; that is, its main purpose is to ensure the continuation of the species in time. With this end in view, it is usually supplied with a thick outer skin, often covered with ridges or spines, and with a reserve supply of food in the form of starch, sugar, or, more frequently,

oil. As the fungi (like other plants) have developed during the course of ages, the special apparatus for the production and protection of these spores has become more and more complex, partly, no doubt, owing to the many changes in external conditions to which they have been subjected; at the same time, the sexual process by which the spores were formed has become simplified, and in some instances, appears to have died out altogether. Nevertheless, the characters of these spores, and the complexity of the organs formed for their production and protection when young, are the principal characters upon which the fungi are classified. For whereas the asexual spores are more generally borne on exposed portions of the mycelium, without any protection, the sexual spores in the higher groups are always borne on, or in, some special form of organ which protects them when young. The full meaning of this will, it is hoped, become clearer in the light of the articles which are to follow.

PART II.

The Simplest Form of Plant Life.—All the processes of life are invariably connected with a peculiar colourless, jellylike substance of a very complicated structure, and containing very many different chemical compounds. This substance is known as protoplasm. Generally, a small portion of this, which is even of a more complicated nature than the rest, is separated from it, and is denser. It is usually spherical in shape, and is known as the nucleus. The nucleus is that part which controls all the different physical and chemical processes which take place in the rest of the protoplasm. Many of the simplest form of life, therefore, consist of a more or less shapeless mass of the jelly-like substance of a very minute size, which contains one or more nuclei. Such forms of life are most frequently met with in water, as there they are less exposed to sudden changes of temperature, or to any danger of drought, or of encountering strong solutions of chemical substances, which might injure the protoplasm. Frequently, these minute living bodies are of a definite egg-shape, and have attached to their sharper end one or more every fine, threadlike outgrowths. Such a thread is known as a cilium. It possesses the power of independent movement, and by lashing about in the water enables the organism to swim, in this way giving it a better chance of obtaining its food. If, to such an organism as the one just described, the green colouring substance known as chlorophyll is added, we obtain the very simplest form of plant known. Such a plant is complete in itself, and can obtain all its food-supplies from the chemical substances dissolved in the water in which it lives. It swims about for some time, until it attains a certain size, after which it divides longitudinally down the middle into two plants, each containing a nucleus formed from the original one, together with half of the original protoplasm and chlorophyll.

Now the fungi, as is well known, are plants which have lost the power of forming their own chlorophyll, and consequently they cannot obtain carbon from carbon-dioxide gas. Thus they must get it from other organisms, either dead or alive. If such a simple form of plant as has been described above were deprived of its chlorophyll, it would be the simplest possible form of fungus. Now, if this fungus had to live in the interior of some other plant, the naked protoplasm might be exposed to harmful chemical substances given off by the host plant. To guard against this, it covers itself with a firm outer coat, or wall, which is very resistant to such substances. These fungi, consisting of a cell wall, protoplasm, and a nucleus, and nothing further, are found among the members of the group *Chitredineae*. Some of these fungi live in the cells of various higher plants, and cause a considerable amount of damage to them; for example *Olpidium*

brassicae, which causes a disease of young cabbages. The full life-history of the fungus is as follows:—It consists of a naked mass of protoplasm, with a nucleus and one whip-like outgrowth, or cilium, attached to its pointed end. It swims about in a drop of water on the surface of the cabbage, and eventually bores its way into the tissues, becomes spherical, and covers itself with a cell wall. It grows, and finally produces a long tube, which penetrates to the surface of the host plant, and projects into any drops of water that there may be on the surface. Meanwhile, the contents of the spherical portion have divided up into numerous minute, free-swimming bodies or *zoospores*, each exactly like the first stage of the original plant. The central, spherical portion of the parent fungus, in which the zoospores were formed, is known as a *sporangium*. The zoospores are discharged through the neck, swim about as before, and finally penetrate the host plant again and repeat the life-cycle.

The next step in the development of the fungi from the simplest forms, is the formation of long fine threads, which penetrate the substratum in search of food. These threads are usually without cross walls in the simplest forms, but possess them in the more elaborate ones. Each thread is known as a hypha, and the whole system of them as the mycelium. The reproductive organs are only borne on certain parts of these threads.

The more elementary fungi require moisture for their reproductive purposes, and in this way show their relationship with the more primitive form of plant which lived in water. In the course of ages, however, these reproductive methods became very much altered, so as to enable the plants to live more conveniently on land, and to reproduce themselves independently of the presence of moisture. How this came about will be shown in discussing the various groups.

The Main Groups of Fungi.—The fungi are divided into four main groups, chiefly in accordance with the characters of their reproductive organs. These groups are as follows:—

THE PHYCOMYCETES.—The vegetative mycelium of the members of this group never forms a compact mass, but usually branches in the tissues of the plant or animal upon which these fungi generally live. Some of them exist saprophytically on decaying substances, but the majority are parasites. There are two forms of reproduction: the first by means of conidia, which germinate either by dividing up to form free-swimming spores, or zoospores, as described for the Chitredineae, or by producing a mycelial tube direct; the second by means of thick-walled, resting spores produced as the result of a sexual process.

THE ASCOMYCETES.—In this group, the mycelium may be either entirely buried in the substratum, or may form a compact mass known as a stroma. The kinds of reproduction may be numerous, but can usually be divided into two classes. In the first class are conidia of various forms, borne on the ends of hyphae, often themselves arranged in some special manner, but almost always freely exposed to the air and not contained in any special receptacle. In the second class of reproduction, there is one constant feature, the presence of an ascus, or elongated sac, which contains generally eight, sometimes four, ascospores. These asci were almost certainly all produced as the outcome of a sexual process in the earlier forms, but many fungi have now entirely lost this sexual process. The asci are found free in the simplest forms, but in the more elaborate ones they are either produced in a closed box, or in a mass on the surface of an expanded disc, which is often rolled up into a closed body when young, but which opens and exposes the mass of asci when ripe.

THE BASIDIOMYCETES.—This group is characterized by the process of a special cell, or *basidium*, on which the reproductive bodies, or *sporidia*,

are borne. This special cell may, in the simpler forms, be divided up by cross walls, and then each compartment produces one or more sporidia. In the higher forms it is non-septate, and produces two, or more, generally four, sporidia borne on short stalks, which project from the upper surface of the basidium. The basidia are generally produced on some form of fruit-body, either exposed, as in the toadstools, or enclosed in a bag or sac, as in the puff balls.

THE FUNGI IMPERFECTI.—In this group are very many species of fungi, which, so far as is known, can only reproduce themselves by some form of conidial fructification. Many of them have been shown in recent years to be only the conidial stage of an ascomycetes fungus, and there is no doubt that some form of higher fructification will be found for many more of them, as our knowledge of these plants increases; but at present, they have to be given separate names for purposes of classification.

These, then, are the four main divisions of the fungi. More detailed information of the various groups will be given in the subsequent articles.

INDIAN TEA IN 1910.

Taking this branch of the Tea industry as a whole, the *Grocer* observes, it still holds the premier position, and is the key, more or less, to the ruling prices of the market. It will be remembered that the crop of 1909-10 part of which comes into the review for 1910, was the largest on record, or, say 16 million lbs. more, *viz.*, 17½ million lbs., were received at the London bonded warehouses, but the total deliveries for the year (January 1st to December 31st) are over 180 million lbs., or quite 1 million lbs. *more* than the previous year during the same period. Home consumption shows an increase of over 2 million lbs., while the export is about 1 million lbs. less, owing to largely increased transhipments and direct export from Calcutta to Russia. The direct exports from Calcutta last season to markets outside the United Kingdom were 8 million lbs., more than the previous year, and as regards the present crop, which up to November 8th showed an increase of 8 million lbs., outside markets have already taken any surplus there may be, and it is very probable that, unless the unexpected happens, we shall receive *less* this season than last. . . .

Stocks are already several million lbs. *less*, and it looks as if the new year must see sustained high or higher rates for the lower grades, as the demand all over the world runs more particularly on leaf for price the yearly increase running into several million lbs. We commenced the year with a stock of 81 million lbs., against 77¾ million lbs. in 1909, and received three million lbs. more to finish up the season. There was a good market for all kinds throughout up to June, prices for common grades improving gradually to ½*d.* per lb., quotations opening at 6¼*d.* to 6½*d.* for clean leaf Pekoe Souchongs. Medium and good liqouring Teas, especially those from the Dooars, and autumn flavoured Teas, were in good request throughout, and finest grades realised long prices—only thin weedy Pekoes and red stalky leaf were neglected. Dealers bought freely, and supplies being more than they expected, some discounts had to be taken on the medium grades. The crop of 1909-10 was a good one, and some of the best teas were very fine. . . .

Latest advices suggest only a crop equal to last season, which means 8 to 10 millions less for the United Kingdom for the season. If this estimate turns out correct, there will be a very high market in the New Year for low priced Teas in particular, and splendid results for the growers for season 1910-11. Possibly it will necessitate the withdrawal of the 1*s.* and 1*s.* 2*d.* canister and so induce the retailer to educate the public to drink a better Tea.

The Planters' Chronicle.

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THE U. P. A. S. I.

(INCORPORATED.)

The Chairman.

Mr. R. D. Tipping has been at the office since Thursday. He returns to Coorg to-morrow morning after discussing various matters.

The Scientific Officer.

Mr. Anstead returned to headquarters on Thursday morning. He leaves for Hunsur on the 5th instant, and will most probably be back here on the 7th idem.

A report of a lecture delivered by him at Yercaud on the 31st ultimo is published on page 66 of the present issue.

Coffea stenophylla.

The first lot of seed ordered arrived this week, and was distributed in execution, or part execution, of various orders. Another lot is on the way, and a third parcel will probably not arrive until next month, when it is hoped that all supplies ordered up to the present time will be delivered. Probably, there will be a few hundred seeds in excess.

Coffea congensis var. chaloti.

Home advices state that this seed will only be available in Europe some time during the current month. Orders on hand are not likely, therefore, to be executed until next month. There will probably be a small surplus supply, and planters who have not yet booked their requirements are requested to do so.

Tea Seed.

The Secretary would be glad to hear from every planter who has a good *jât* of Tea Seed to offer. Full description should be kindly given, together with statement of price and of probable quantity of next season's crop and time of delivery. As transactions will be for London account, business cannot be expected to result until a reference has been made by mail.

Rubber Seed.

As in the case of Coffee Seed, planters would probably save money by ordering collectively. Quotations for different varieties have been received from dealers in Europe and can be communicated to individual planters on request.

Scientific Officer's Papers.

LIV.—Plants and Beneficial Insects.

Planters all the world over suffer so much from the depredations of insects that they are apt to think that all insects are harmful, and to lose sight of the fact that a great many of them are beneficial, and that without their aid the industry of agriculture would in many cases be impossible.

Most plants depend upon insects to produce seed. If a Coffee flower, for example, be examined, there will be seen in the centre of it a white spike, which is called in botanical language the *pistil*. At the apex this branches into two sticky parts known as *stigmas*. Round the centre of the pistil will be seen a ring of 5 to 7 white threads, known as *stamens*, and these shed a white powder, called *pollen*. For the fertilisation of the bean to take place it is necessary for some of this pollen to be transferred to the sticky surface of the stigmas. Here it germinates, almost like a seed growing, and puts out a minute tube which grows down the middle of the pistil till it reaches the little green knob-like ovary at the bottom. The contents of the pollen grain pass down this tube and unite with the ovary cell, fertilising it, and it is only after this process has taken place that the ovary can develop into a coffee berry. If fertilisation does not take place the ovary falls off soon after the flower fades, and this is what happens when rain falls on the opening blossom; the pollen is made wet and often killed, and none of it is transferred to the stigmas. Now, although the Coffee flower is so arranged that it can fertilise itself to a certain extent, the transference of pollen to the stigma is largely performed by the unwitting agency of insects like bees, and in many flowers the transference can only be effected by insects. The colour and the scent of flowers is developed simply to attract insects, and secreted at the base of the flower is a store of honey which the insects come to collect. Pushing into the flower to get this honey they get covered with pollen from the stamens and they rub some of this pollen off on the stigma of the next flower they visit. In this way cross-fertilisation is effected; that is to say, the pollen from one flower is carried to the stigma of another separate flower, possibly on another plant; and this cross-fertilisation is necessary to produce good seed for growing purposes and the propagation of the species.

Flowers in general are designed of different shapes and colours to attract special kinds of insects, and they have all sorts of most wonderful and interesting devices to prevent the wrong kinds of insects getting at their honey, and for making sure that the stigmas in one flower shall touch that part of the insect's body which has been dusted with pollen during a previous visit to another flower, and in many cases the pollen from the individual flower is all shed before its stigmas open and become receptive. The subject of the fertilisation of flowers by insects is, in fact, a most fascinating one in every way, and it will well repay careful study by any one in need of a hobby.

Burkill, in Lefroy's "Indian Insect Life" says that the Xylocopas, the genus to which the large Carpenter bees belong, "are the most important of flower-visiting insects in the plains of India, and are of very general distribution. They have large size, and long tongues, and visit persistently all day, and some of them also on moon-light nights. The Sun Hemp crop is largely fertilised by them, and possibly the Indian pulses."

So important are the visits of bees to the success of some crops that they are kept on the estate in hives, and I know of one instance in Mysore where a Coffee planter has adopted this system with, as he believes, a distinct influence on his yield of coffee.

It is of interest to note that in German East Africa advantage is taken of the visits of bees to the Ceará flowers to run a secondary industry in bees-wax with this cultivation. The following account is given of this in the Bulletin of the Imperial Institute, Vol. VIII, No. 1:—

" It has been observed that wild bees are attracted in large numbers by the flowers of the Ceará Rubber tree (*Manihot Glaziovii*) and other cultivated crops. In German East Africa swarms of bees are encouraged to settle, by placing in favourable situations on the plantations, rough hives, consisting of hollow branches or tree trunks, boxes, or cleansed kerosene tins. A piece of honeycomb placed in these receptacles soon attracts a swarm, and when once the bees can be induced to settle they increase rapidly. These rough hives are quickly filled with honeycomb, which is removed at night in the ordinary way, care being taken to leave sufficient honey in the hive to encourage the bees to start building again. The comb containing brood is not taken, and special precautions are observed to prevent the natives from stealing the broodcomb, as they like to eat young bees. To 'render' the wax, a modification of a process already described is adopted. The comb containing the honey is broken up, and thrown into a large vessel and carefully melted at a low temperature. The wax separates from the honey, and when both have cooled, the former rests on the latter as a solid cake. This cake is removed, the under surface, which contains impurities, is scraped off, and the remainder broken up into small pieces and melted in the presence of several times its bulk of water. Whilst in a melted state the wax is filtered through a piece of cloth and finally run into moulds. Any vessel may serve as a mould provided its shape is such that the solid cake of wax can be easily removed.

" The honey obtained from the flower of the Ceará Rubber Tree is unsuitable for food, but is fed to the bees. These eat it greedily, and use it for the production of wax, with which to replenish their hives with comb. It is estimated that a strong swarm of bees will produce from 7 to 11 lb. of wax in a year, and as the cost of collecting and preparing it for export is small there is a good return for the labour and expenditure involved."

Gardeners and florists often pollenate flowers themselves with the object of crossing two species of plants and producing a hybrid which will exhibit some new form of colour or shape, and the work of Luther Burbank in this connection is world-famous. Coffee hybrids have been produced in this way, and work is now being done with these, and it is hoped during the course of the next few years to produce new hybrids by this means, and improve the existing ones so as to produce a plant which will be disease-resistant, and which will give crops of bigger yield and better quality than those obtained from the Arabica species at present grown. (See *P. C.*, Vol. V/1, p. 126).

(To be continued).

RUDOLPH D. ANSTEAD,

Planting Expert.

Under section 4 of the Madras Planters' Labour Act, 1903, the Governor in Council is pleased to authorise Mr. Thomas Stanley Gillatt, of Sentinel Rock Estate, Velleramulla, Wynaad, Malabar, to witness the execution of labour contracts.

DISTRICT PLANTERS' ASSOCIATIONS.

Central Travancore Planters' Association.

Proceedings of the Annual General Meeting of the Central Travancore Planters' Association held at Twyford Bungalow on Saturday, the 14th January 1911, at 10 a.m.

PRESENT.—W. H. G. Leahy (Chairman), B. Wolde, F. Bissett, F. E. Thomas, T. C. Forbes, T. A. Vernon, R. P. Roissier, J. S. Wilkie, D. McArthur, J. H. Cantlay, and H. C. Westaway (Honorary Secretary).

The minutes calling the meeting were read.

The proceedings of the last general meeting were confirmed and taken as read.

CHAIRMAN'S REPORT.—Gentlemen,—The past year has been a very eventful one and memorable in many ways. The Nation had to mourn the loss of a popular and wise ruler in King Edward VII, who was called to his last rest when he was most needed by the nation, and it is very fortunate for us that we have such an able and worthy successor in His Majesty King George V, who has made such a fine start and whose reign promises to be such a brilliant one. The announcement of the Royal visit to India in 1912 has caused immense gratification to all his Indian Subjects, who will be able to give proofs of their loyalty to their Emperor in person. During the year there has been a change of Viceroys, and the present prosperous state of the country and the absence of the "unrest" of which we heard so much of late, augurs well for the present Viceroy's rule. Coming to matters which immediately concern ourselves, the present flourishing state of the tea market is mort gratifying to us all, and we hope that the present little "ray of sunshine" which we seldom see and generally so briefly get will be with us for some time to compensate us for all those dismal and cloudy years which we get so often and for such long periods. Nobody, I am sure, will grudge the planter his little spell of prosperity, and we can only hope that this little "ray of sunshine" we are now enjoying will not be an excuse for the authorities (Home and Indian) to in any way tax us on our produce.

Theni Bridge.—This has at last been started, and we trust will soon be completed.

Travancore Legislative Council.—An innovation by the local Government was the appointing of a member of the planting community on the Legislative Council, which we greatly appreciate, as it will bring us into closer touch with Government and means that planting interests, which are now so huge in Travancore, will get better and more attention.

The Scientific Officer paid two visits to this district, and now that he has a fully equipped laboratory at Bangalore we trust he will be better able to help us with the only trouble we have up here, and that is *helopeltis.*

Motor Transport Scheme was dropped, and as far as I am aware there has been very little difficulty about carts.

Munsiff's Court.—The removal of this court to Meenatchil has caused us great inconvenience, and both this and the Mundakayam Association have strongly represented matters to Government and we trust Government will yet alter its decision.

Taxes.—A matter which has troubled us greatly was the increase of taxes. The Coffee lands tax, which was reduced from 12 to 2 annas after the Coffee smash, was again raised to 12 annas in 1908, and now has been raised to Re.1, together with the tax on all lands planted in tea from 12 annas to

Re.1. As nearly all the old coffee land was planted with an inferior jât of tea, either China or Hybrid, (owing to the ignorance of the importance of jât in those days) and as this class of tea requires very high cultivation (owing to its small yield) to make it remunerative, and is also the tea which suffers most from the only pest we have, *i.e.*, ***helopeltis***, the increase of the tax on those lands was a great shock to us, especially as the coffers of the Travancore State are full to overflowing. We would like to see some of this money which will accrue to Government from the increased taxation, spent on our main and branch roads, and bridges in the district. The section of the main road between Peermade and Kumili is in a very bad state, and though we have called Government's attention to it we get nothing done. To show you how things are neglected, the revetment near the 58th mile, which gave way in May 1909, has not yet been touched, and with the next big showers will probably make the road impassable.

The European Doctor Scheme—after several meetings of the Committee, is practically settled and it only now remains to decide the question of a Bungalow for the Doctor, and the signing of the trust deed. The Directors of the two Companies who were asked to look out for a suitable man have replied that they are arranging to do so, and we hope shortly to hear of a suitable man we can appoint to the post. I will not mention any other subjects for fear I am encroaching on the Honorary Secretary's report, which embraces everything we have attemped to do in the past year. The accounts, duly audited, are placed on the table, and show a credit balance of Rs.720-11-9, which is very satisfactory. I think I can safely say we have nearly all experienced a very good year, as far as crops and prices go, in spite of the tediously long S. W. monsoon, and that our labour generally was sufficient.

In conclusion, gentlemen, it only remains for me to thank you all for your kind support during my term of office. My thanks are due to the Committee for their advice and assistance and to Mr. Westaway I am more than grateful for the very successful way he has carried on the Honorary Secretaryship, and for making my position such an easy and pleasant one, and it has been a great pleasure to work with him. I now resign the Chairmanship.

HONORARY SECRETARY'S REPORT FOR THE YEAR 1910.—Mr. Chairman and Gentlemen.—There have been three committee, three quarterly general meetings, and one extra-ordinary general meeting held during the year, the average attendance at which was thirteen members.

Theni Bridge.—This is at last to be built, and I am given to understand is now in course of construction.

Munsiff's Court.—This is still at Meenatchil although His Highness's Government have been written to several times asking them to remove it to Kottayam or keep it at Kanjirappalli if they could not see their way to removing it to Peermade. I am, however, given to understand that Government are prepared to give us a separate court up here, so I hope it will soon be an accomplished fact.

Roads.—These are still in much the same state but I must say that I think it will be generally acknowledged that the Cardamom Hill and the Glenmary roads have been much improved, and that the thanks of the Association are due to the Road Committee for the work they have done.

Kottayam-Kumili Road is still in disgraceful order, especially that part from Aruday to Kumili. Government have been written to several times on the subject, but little attention has been paid to our letters. I notice that a great amount of metal has been broken on the ghaut, which will, I presume, be rolled in during the monsoon.

Green Tea Bonus.—Nothing further has been done, but it is to be brought up at the annual meeting of the Indian Tea Association.

European Doctor Scheme.—This is, I am glad to report, an accomplished fact, and think our Chairman deserves the Association's heartiest thanks for taking the great interest he has in it and pushing it through.

Scientific Officer.—This gentleman paid the district two visits during the year, and on one occasion gave us a lecture.

Membership.—The number of members of this Association is 17, representing a declared acreage of 9,012½ as compared to 16 members representing 8,483 acres in 1909.

Crop for 1910.—This is 4,895,725 lbs. or an average of 543 lbs. per acre. I have taken the acreage as that on which subscriptions are paid as being in bearing.

ACCOUNTS.

	Rs.	A.	P.	Rs.	A.	P.
Receipts—						
By Balance from last year				527	14	11
By Subscriptions for 1910				1,689	12	8
By Bank interest				23	7	0
Total Rs...				2,241	2	7
Expenditure—						
To expenditure for 1910 ...	1,520	6	10			
Balance to be carried forward	720	11	9			
	2,241	2	7	2,241	2	7
Planters' Benevolent Fund—						
By Subscriptions				290	0	0
To Remitted to Secretary, U. P. A. S. I.	290	0	0			
	290	0	0	290	0	0
King Edward Memorial Fund—						
By Subscriptions				150	0	0
To Remitted to Secretary, Madras Branch	140	0	0			
Balance in hand	10	0	0			
	150	0	0	150	0	0
Lady Ampthill's Nurses' Institute—						
By Subscriptions				135	1	0
To Remitted to Secretary, L. A. N. I.	135	1	0			
	135	1	0	135	1	0

I lay detailed accounts of all the above on the table in case any one would like to see them.

In conclusion I have to thank you, gentlemen, for the honour you have done me in electing me as your Honorary Secretary and I now beg to tender my resignation.

Correspondence.—Read letters from the Secretary, U. P. A. S. I. No. 54/10 dated 31st October 1910, No. 55/10 dated 15th November 1910, No. 56/10 dated 21st November 1910, No. 57/10 dated 6th December 1910, No. 58/10 dated 23rd December 1910, and letters dated 14th and 26th November 1910.

The Meeting confirmed the Honorary Secretary's letter of the 31st December in reply to this, and was in favour of the Rs.80 being paid out of the U. P. A. S. I. fund.

No. 59/10 dated 24th December 1910, No. 1/11 dated 3rd January 1911, No. 2/11 dated 6th January 1911, No. 3/11 dated 9th January 1911. It was resolved that in reply to this the Honorary Secretary do write saying that this Association is in favour of a member of Messrs. Parry & Co. being asked to serve on the Indian Tea Cess Committee, failing which either Messrs. Abbott or Malcolm be asked.

No. 4/11 dated 9th January 1911.

Read letters from the Sub-Division Officer P. W. D. No. 179 dated 19/10/10, No. 200, 17/11/10, No. 196, 8/11/10, No. 201, 17/11/10.

Read letter from Section Officer No. 615 of 26/11/10.

Read letter from Sub-Division Officer No. 206 of 28/11/10.

Read letter from Chief Engineer dated 22/11/10.

Read letter from Division Officer, Kottayam No. 2133 of 19/11/10.

No. 2147 of 22/11/10, No. 2212 of 1/12/10, No. 7 of 1/1/11.

Read letter from Superintendent, Cardamom Hills, No. 3185/a of 10 dated 16th November 1910.

Read letters from Mr. J. A. Richardson dated 16/11/10, 19/11/10, 3/12/10 and 10/12/10.

Read letter from Mr. J. F. Fraser dated 14/11/10.

Read letter from Chief Secretary to Government *re* rules with regard to hunting, etc. "It was resolved that this be left to the District Game Preservation Society."

Read letter from Kanan Devan Planters' Association dated 14/11/10.

Read letters from the Mundakayam Rubber Planters' Association dated 30/10/10, 8/11/10, 20/11/10, 22/11/10, 25/11/10, 28/11/10, 10/1/11, 11/1/11.

Proposed by Mr. McArthur, seconded by Mr. Forbes : That the Honorary Secretary be instructed to write saying "that this Association does not see its way to join the scheme as outlined in their letter of the 10th January."

District Labour Rules.—The Honorary Secretary explained that this had been put on the agenda by mistake, so nothing was done.

Fitter Fund.—The accounts were laid on the table by Mr. Cantlay, Honorary Secretary of the fund, and explained. It was proposed by Mr. Forbes, seconded by Mr. Cantlay "That the old cess of 8 annas per 1,000 lbs. of tea be reverted to for the year 1911." The question of new Estates which were just coming into bearing joining the fund was discussed, and the feeling of the meeting was that they should be allowed to on paying the current cess. If was proposed from the Chair and carried unanimously : That Messrs. Cantlay, Bissett and the Superintendent, Glenmary Estate, do form the Fitter Fund Committee for 1911, and that an estimate be made for a new building to hold a new lathe lately purchased.

Subscription for 1911.—Proposed by the Honorary Secretary and seconded by Mr. Verson : "That the subscription to the Association for the year 1911 be at the rate of 2 annas per cultivated acre." Carried unanimously.

District Road Committee.—Proposed from the Chair : "That the following road Committee be appointed for 1911 :—Messrs. Forbes, Westaway, Fraser, Cantlay, and the Superintendent of Glenmary Estate." Carried unanimously.

Proposed from the Chair: "That the Estates concerned assess themselves on the Cardamon Hill and Glenmary roads for the year 1911 as done in the last two years, and that when Mr. McArthur is in Trivandrum he be asked to interview the Chief Engineer, and do his best to get the grants increased, and that the Honorary Secretary do give Mr. McArthur all details."

Resolved that the Honorary Secretary write to the Government, and point out that nothing has so for been done to the bridge on the 2nd mile, Cardamon Hill road, except the dismantling, and that they be requested to push on with the reconstruction at once.

Election of Officers and Committee for 1911.—The meeting then voted for these, when the following were appointed :—

Chairman	...	W. H. G. Leahy.
Vice-Chairman	...	F. Bissett.
Hon. Secretary	...	H. C. Westaway.
Committee	...	T. C. Forbes, D. McArthur.

The Chairman :—Gentlemen—I thank you for the honour which you have done me in again electing me as your Chairman. I was hoping that one of the younger generation would come forward, but as this is not the case I shall be pleased to do my best for you. I thank you, gentlemen.

Honorary Secretary.—Mr. Chairman and Gentlemen—I can but repeat what Mr. Leahy has said, and since you have done me the honour of again electing me I shall be pleased to do what I can for you.

European Doctor Scheme.—The Honorary Secretary of the Scheme explained that he had heard from home from the Travancore Tea Estates Co. and from Messrs. Rowe, White & Co., Ltd., that they had a suitable man in view, a Dr. Scott Byrnes, with experience in S America and elsewhere, and who has been through the Tropical School of Medicine, but would not accept the billet under £400 per annum, and that they doubted very much if we should get a suitable man for a less sum. It was proposed from the Chair: "That this meeting authorises the District Committee to accept the offer of Dr. Scott Byrnes at £400 per annum, provided that on an estimate being drawn up, it is found that the estimated cost of maintaining the Doctor Scheme for a period of five years, does not exceed an average of 8 annas per acre per annum. That the Fairfield small bungalow be rented for one year, at the rental of Rs.35 per mensem fully furnished."

With a vote of thanks to the Chair the meeting terminated.

(Signed) H. C. WESTAWAY,
Honorary Secretary.

South Travancore Planters' Association.

Minutes of the Annual General Meeting held at Quilon Club, on January 13th 1911.

PRESENT :—Messrs. D. G. Cameron (Chairman), H. W. Heberden, A. W. Leslie, C. J. Hall, W. E. Bownass, W. Mathuson and L. G. Knight (Hon. Secretary).

By proxy :—Mr. J. S. Valentine. *Visitor* :—Mr. T. H. Cameron. The Chairman's report was as follows :—

Gentlemen,—Our last meeting is so recent that there is little beyond the usual formalities connected with the Annual General Meeting requiring your consideration to-day.

During the year the subjects which received most attention are :—

Increase of Land Tax.—Although we protested against this ineffectually, really the increase from 12 annas to Re.1 is not a serious matter, and we have not much to complain of. The Dewan explained to me that unless the increase were given effect to now, it would have to wait over for the next settlement 30 years hence; the additional revenue will, he added, enable Government to more sympathetically consider Planters' needs in regard to roads and other matters.

Planters' Benevolent Fund.—This may be considered to have made a good start, and I hope will go on and prosper. As we all know by experience, anything out of the usual routine is difficult to get under way, but having got so far there should be no going back.

U. P. A. S. I. Annual Meeting.—Our representative gave effectual support to the various matters in which we are more especially interested, and as he has fully reported to you already, there is nothing for me to add.

Lady Ampthill's Nursing Institute.—As an experimental matter, a nurse has been stationed in Quilon during the last 7 months—out of this she has been employed only 40 days. This being so, the Lady President, Lady Lawley, regrets the Institute is not justified in continuing to station a nurse at Quilon, as nurses are urgently required at the Head Quarters, Madras. Of course, Travancore subscribers are still on the same footing as other out-station members and can always have a nurse from Madras.

Scientific Officer.—There has been much discussion during the year as to the best means of giving practical effect to all that his knowledge and experience suggests for fighting the pests that already trouble us and to guard against those which may come later on. I feel sure, as time goes on, he will be able to do more and more in this way. A very able contribution to the subject has been Mr. Brown's speech in Mysore, which you have, no doubt, all read. Other suggestions come from Mysore and Mundakayam Associations and a definite proposal from the latter will come to you to-day.

European Ward in Quilon.—Nothing of a definite nature has so far come of our application. This is not a matter we can press as a right, but I am sanguine that later on Government will give it favourable consideration. What is wanted is a separate ward suitable for the class of patient, who is willing and able to pay for the increased comfort and convenience, which this would provide. Although we call this a European ward, it would be equally available for Hindu or Mohomedan those willing to pay the fee.

Game Laws.—The Secretary has addressed Government asking for some reasonable modification of the Laws proposed, and I have also been asked to bring the matter up at the approaching Sri Mulam-Meeting.

Cattle Grazing on the Southern District.—This is also a subject which may be important in the near future.

Mr. D. G. Cameron was selected Chairman pro-tem.

The Honorary Secretary read out the accounts for the past year and then resigned.

Election of Office-bearers.—Proposed by Mr. Heberden and seconded by Mr. D. G. Cameron that Mr. R. Ross be asked to act as Chairman for the year, and that Mr. S. W. Sinclair be asked to act as Honorary Secretary, and that Messrs. J. S. Valentine, W. E. Bownass and J. Stewart be members of the Committee. In the event of Mr. S. W. Sinclair being unable to act as Honorary Secretary, Mr. A. W. Leslie agreed to act.

Mundakayam R. P. A.: Proposal to engage a Scientific Officer specially for Travancore and Cochin.

Proposed that the Honorary Secretary, M.R.P.A., be informed that the S.T.P.A. do not see the necessity of employing an Assistant to the Scientific Officer at present in Travancore.

Proposed new Game Laws.—Read the views of the C. T. Game Society on the subject.

Resolved that Mr. F. Bissett be written to saying that this Association thoroughly approves of his suggestion that a joint discussion between delegates from the various Travancore Associations should be held in Trivandrum during Sri Mulam week.

Subscription for 1911.—The estimated expenditure having been gone into it was "Resolved that the subscription to this Association remain the same as last year, *i.e.*, 3 annas for every cultivated acre."

A vote of thanks to the retiring Chairman and Honorary Secretary closed the meeting.

(Signed) L. G. KNIGHT, *Ag. Hon. Secretary.*

The Nilgiri Planters' Association.

A Meeting of the Nilgiri Planters' Association was held at the Collector's Office, Ootacamund, on the 12th December, 1910.

PRESENT :—Mr. W. Deane in the Chair, Mr. W. Rhodes James, Mr. A. W. Cherry, Mr. T. Brown, Mr. J. Hardy, Mr. P. Beaver, and Mr. L. L. Porter, Hon. Secretary.

It was resolved that the Hon. Secretary be instructed to arrange with Messrs. Wiele & Klein for the enlargement of a photograph of Mr. H. P. Hodgson (which was shown to the meeting) to a size 23 x 17 at a cost of Rs.40 and Rs.17 for a suitable frame for presentation to the U.P.A.S.I.

Correspondence between the Collector and Mr. R. D. Anstead relative to the proposed experimental garden on the Coonoor Ghaut was read, and it was agreed that further discussion was unnecessary pending Mr. R. D. Anstead's approval of the land.

Circulars from the U.P.A.S.I. relating to the Non-Service of Warrants, attestation of agreements in Mysore, extradition and Emigration were read. With regard to the latter it was suggested that the Hon. Secretary be asked to find out what are the existing regulations with regard to immigration.

Mr. C. H. Browne's proposal for extra Scientific Officer was discussed, and it was proposed by Mr. W. Rhodes James and seconded by Mr. J. Hardy that further discussion be postponed until Mr. C. H. Browne's proposal had taken more definite shape and further details as to number of assistants, cost, &c. were obtained.

Government circular with regard to control over Importation of Plants recorded.

(Signed) L. L. PORTER, *Hon. Secretary.*

Proceedings of the Shevaroy Planters' Association.

A special meeting of the Shevaroy Planters' Association was held at "Fairlawns" on 31st January to meet the Scientific Officer, who had come, by special request, to deliver a lecture on the subject of the cultivation and preparation of Ceará Rubber.

In connection with this an exhibition of Rubber had been arranged by Mr. B. Cayley, and this proved a great success, and the experiment is well worth repeating.

Eight or ten estates were represented, and samples of Ceará, Pará, and mixtures of the two, together with scrap and smoked sheet, were shown. These samples made an attractive display and elicited a great deal of attention from those present. They were inspected and roughly judged by the Scientific Officer, the 'Marylands' sample of Ceará being considered the best. The common fault was the presence of too much resin, due to a wrong method of washing. The 'Hawthorn' estate exhibited some very attractive samples of Pará Rubber, and also some mixtures of Pará with Ceará and Castilloa which were of special interest.

Considering that the industry may be said to be in its infancy on the Shevaroys the exhibition was most encouraging.

At 2 p.m. the chair was taken by Mr. Chas. Dickins, between 45 and 50 members and visitors being present, among whom were many ladies. After a brief introduction by the Chairman, Mr. Anstead delivered the following lecture :—

" Mr. Chairman, Ladies and Gentlemen,

" At your special request I have come here to talk to you about Ceará Rubber, the cultivation of which, I understand, you have decided, and I think wisely so, to seriously take up. During the last year or two Ceará Rubber has come into favourable prominence, and though it presents more difficulties than Pará Rubber in its tapping and preparation, these difficulties are superable, and have in fact been overcome in Coorg to such an extent that Ceará rubber is being produced in quantity, and machinery is now being set up to deal with it. As far as Coorg, at any rate, is concerned the cultivation and preparation of this kind of rubber is largely beyond the experimental stage. There are still many things we do not know about it, but that it is a success and a profitable industry is established beyond a doubt.

" I must congratulate you upon the most interesting exhibition of samples displayed here to-day. The idea of holding little exhibitions in connection with Planters' Association meetings like this is a good one and one which I hope to see continued and developed in the future. It has given me much pleasure to examine and judge the samples, but I must warn you that I am not an expert in judging raw rubber by any means. The final judgment in any case lies with the manufacturer, since the value of rubber largely depends upon how it vulcanises. I hope that the Shevaroys will send some exhibits to the exhibition which it is proposed to hold again this year in connection with the U. P. A. annual meeting.

" What I have to tell you, this afternoon, is largely based on the results which have been obtained in Coorg. The great advantage of Ceará is that it will grow at high elevations and where the rainfall is too small for Pará. The growth is extremely rapid in such districts. I have just seen some Ceará in the Anamalais at a high elevation, the growth of which is remarkable. Straight stems, branched high, should be aimed at, and to obtain this close planting seems to be desirable. The trees will not resist wind, and when planted closely they protect one another. As they begin to get big they should be thinned out, and the best way to do this appears to me to be to year by year tap to death and remove the weaklings and those which have become overtopped and overshaded by their neighbours. This will leave the big trees irregularly spaced, but that does not particularly matter. If a regular system of cutting out is adopted, every other tree or every other line being removed, it will be found that good trees must often be sacrificed and weak ones left.

"When thinning out, trees which have been killed should be entirely removed and the stumps dug out, for Ceará is very susceptible to Stump Rot and the trees in the immediate neighbourhood of a dead stump are very apt to be attacked and die. When this species of Rubber has been planted on old coffee land, especially where the Coffee has died from Stump Rot, a large percentage die of this disease. Every reasonable precaution should be taken to protect them from the disease, and to remove, or isolate, all old stumps in the clearings, and Lime should be freely applied when the disease appears, while attacked trees should be at once uprooted and burned.

"When the trees are tapped they will be found to vary a great deal in yield; while some give a copious flow of latex rich in rubber, others give hardly any. Hence seed cannot be depended upon to give a level plantation and where possible clearings should be planted with cuttings, rooted in a nursery, taken from trees known to be of good yielding qnality. There is, no doubt, an opportunity here to breed a tree which will give an improved yield of latex, and it is also possible that a hybrid between Ceará and the Maniçoba Rubbers, which are closely related to it, might prove to be better than any of the varieties now grown. This is the work which I hope to have an opportunity of doing.

"The first real difficulty with Ceará Rubber appears when the trees are tapped. Apparently the wetter the climate the more difficult it is to make the bark heal. The first step is to strip the rough outer bark off that portion of the tree which is to be tapped. How long this should be done before tapping is commenced appears to differ from district to district, but it will be found that sufficient time must be left to enable the inner green bark to harden sufficiently not to tear under the edge of the knife. Under no circumstances should the trees be stripped until, or unless, they are about to be tapped.

"In a dry climate the half herringbone system of tapping and paring can be adopted, but if the rainfall is high it will be found that the bark instead of healing splits away from the tree, fungi get in, and first the bark and then the tree dies. If this occurs the vertical system of tapping must be adopted. A cut is opened vertically down the tree, and this original cut is then pared on one or both sides. In Coorg another system is used. The bark there is often found to be so thin that it cannot be pared, and a fresh cut is made at each tapping. The tree is first marked out into a herringbone pattern on one quarter of its face, the side cuts leading into a central channel being one foot apart. At the next tapping an equal number of cuts are put in half way between the originals, at the third tapping the same number of cuts half way between the second cut, and so on. The trees are tapped every fourth day, and the yield is found to be good and the healing of the bark perfect.

"For paring, a Barrydo or any suitable paring knife can be used; for the Coorg system, the Pask V knife appears to be the most suitable. It must be remembered, however, that in tapping it is not the knife but the man behind the knife that counts. I do not think it matters which of the many knives on the market you choose, but having chosen one, teach your tappers to use it well, and keep it sharp. Half the bad tapping which I have seen has been due to using a blunt knife, and it is impossible to tap well and avoid cutting the cambium unless the cutting edge is very sharp.

"The next difficulty which occurs is that it is often found that the latex will only flow for a very short time, and then it coagulates in the cuts. When this occurs a drip tin must be used, a tin cone with a fine hole at

the apex. This is hung at the top of the cut and is especially adapted to the vertical system of tapping. The tin is filled with Ammonia, which slowly drips from the apex and runs down the cut, carrying the latex with it and preventing its coagulation. The strength of Ammonia which should be used varies from 1 to 5 per cent. and differs from district to district, and possibly differs in the same district at different times of the year. The right strength must be determined by experiment. Ammonia is quite cheap, and I am now trying to make arrangements to have it put up in stoppered bottles in a cheap and handy form.

"The preparation of the rubber from the latex presents no difficulties if one or two essential points are attended to. Coagulation may be produced with Acetic Acid just as in the case of Pará latex, and I would refer you to an interesting article on the 'Right use of Acetic Acid in the Coagulation of Hevea Latex' by Mr. John Parkin, which was reproduced in the *Planters' Chronicle*, Vol. V, p. 687, where some valuable hints will be found. In Coorg Formic Acid is used, and Mr. G. L. Newberry, who has made many experiments with a Ceará latex, writes to me on the subject as follows:—"I do not like Acetic Acid. I think that of all the acids Formic is the safest and the best, besides being a preservative. I use a 2% solution, and this is practically ½ ounce per quart of water. This solution I use at the rate of 1 ounce per 35 ounces of latex which I find gives the best results." I find that Acetic and Formic acids appear to be equally suitable, but in all probability the best coagulant for Ceará latex has not yet been discovered, and it is quite possible that the coagulant which will suit one district will not prove the best in another district.

"Having coagulated the latex it is rolled between wooden rollers and well washed with clean water, and in this washing lies the secret of making a biscuit of good colour free from resin. The water should run over the rollers all the time the rubber is being rolled, and the process should be continued until the water coming away is quite clear. After the biscuits leave the rollers they should be dried till they will not stick together, and they should be packed for export in boxes which have been planed inside, and no paper or packing which may stick to the rubber should be used.

"It is essential that everything connected with the latex and the factory should be kept scrupulously clean. The collecting cups must be kept clean from rust and coagulated rubber, and the coagulating dishes should be washed after use with hot water. The cleaner the whole process is kept the more successful it will be. Discoloured biscuits, containing spots and films of colour, are nearly always due to dirty cups or dishes, and when these are cleaned up and sterilised the trouble disappears. Tapping knives should also be kept clean and occasionally sterilised.

"The smoking of rubber in South India is only in a very experimental stage and I have no reliable results at present which I can put before you. There is much to be learned still about the production of Rubber of all kinds and there is a big field for experimental research. A series of very interesting experiments are being carried out in Coorg, among others the effect of fertilisers upon the yield of latex. The use of Nitrate of Soda has been said to increase the yield of Ceará latex, and this is being tried on a picked series of trees, and I hope to be able to publish the results obtained in the *Planters' Chronicle*, very shortly.

"In the meanwhile I shall be glad to associate myself with any experiments which may be carried out in the Shevaroys and happy at all times to give you all the assistance in my power."

At the close of the lecture an informal discussion took place, and the proceedings closed with votes of thanks to Mr. Anstead, and to Mr. F. D. Short for his kindness in lending the room for the Exhibition and lecture.

RUBBER.

The Da Costa Coagulating System.

A machine which is attracting widespread interest among rubber planters in the Far East is that invented for the coagulation of rubber latex by Mr. Jose Sinao Da Costa, of Pará. Its design is to make practicable by simple mechanical means the native process of smoking the latex of *Hevea Brasiliensis* practised by the natives in the Amazon region. It is well known that the latex from the Pará trees will coagulate by the action of heat. It is known that fairly large samples of rubber were produced in Brazil coagulated by other means than smoking long before the Eastern rubber industry was founded. Nevertheless it is still regarded in Brazil that by smoking alone can be obtained those lasting properties of resiliency and tensile strength which are the denominating characteristics that have gained for the product of *Hevea Brasiliensis* its supremacy among rubbers.

Mr. Da Costa, who has spent practically a life time in the Amazonian rubber interest, is among those who believe in the virtues of smoking rubber, and he has patented this process with a view to making it more economical than the native smoking method, and particularly for the plantations of Ceylon and Malaya. As is well known, the best prices for plantation products are now obtained for "smoked sheet."

The operation of this process is simple. The latex, when brought from the trees, is first strained, if it contains mechanical impurities, and is then poured into the coagulating tank on the top, steam having in the meantime been raised in the boiler below from a fire of forest woods alone. On this wood fire are then thrown green palm leaves, nuts, or any green twigs, the distillation of which produces acetic acid, whilst the fumes of the green foliage contain creosote to some extent. The fumes are collected in a special chamber, and, after being cleared of dust, etc., are forced into the coagulating tank by a steam injector. During the agitation thus caused the smoke thoroughly permeates the latex, and in about ten minutes, or rather more, according to the quantities to be dealt with—the caoutchouc globules coagulate and separate, and at the same time rise to the surface. After being allowed to cool off in the tank, the coagulated rubber is taken to a small press and turned out in the shape of flat block rubber, which is afterwards reblocked into cube form, and, after being dried, is ready for shipment.

The Da Costa system is manufactured by Messrs. David Bridge & Co., Engineers, of Castleton, Manchester, England, It was exhibited by them at the late Exposition Universelle at Brussels, where a practical illustration of it was given. Latex was coagulated there by the Da Costa system and then put through the other various machines manufactured by the Messrs. Bridge & Co., with the result of obtaining rubber in crepe, sheet, and block forms. It may be mentioned by the way that Messrs. Bridge., were awarded the *Diplome de Grand Prix* at the Brussels Exposition, for rubber preparation machinery. They have prepared a handsome souvenir book illustrating and describing the various forms of apparatus which were embraced in their Brussels exhibit.—*The India Rubber World.*

Future Prices.

In viewing conditions generally, observes an American manufacturer, I would say that the prospects for 1911 favour lower prices for crude as compared with 1909 and 1910, and in my opinion this will stimulate the consumption in all lines. The outlook on the whole is good.

SELECTED CUTTINGS.

Fungus Notes.

The Chief Groups of Fungi.—PART III.

In the last article, a short account was given of the four main groups into which the fungi are divided. It now remains to discuss these groups and some of their more important sub-divisions in somewhat greater detail. This will be the object of the remaining articles of the series.

The Phycomycetes.—The group of fungi which contains the most primitive forms is that referred to in the last article as the Phycomycetes. It is subdivided into two main branches: the Oomycetes and the Zygomycetes. The distinctive characters of these are as follows: In the Oomycetes, asexual reproduction is by means of sporangia producing free-swimming zoospores, as described in the case of the Chytridineae, or the contents of a sporangium may grow out at once and form a germ tube. Sexual reproduction is by means of two specialized organs usually formed on short lateral branches of the hyphae. The female organ is known as the *oogonium*, or egg-forming organ; the male as the *antheridium.*

In the Zygomycetes, asexual reproduction is by means of small non-motile spores produced, usually in large numbers, in a sporangium. The other form of reproduction generally takes place by means of two similar hyphae, which are not sexually differentiated as far as can be seen outwardly. The tips of these two hyphae fuse, (become intimately joined together, the walls between them being absorbed) and a spore is produced at the point of fusion. Such a very simple form of the fertilizing process is known as Conjugation.

The Oomycetes.—As an example of the life-history of one of the Oomycetes, that of *Phytophthora omnivora* may be described. This fungus causes the black rot disease of cacao pods. The mycelium grows in the tissues of the host, and produces short external hyphae at right angles to the surface; each of these is usually once or twice-branched, and the branches bear terminal large, pear-shaped, conidia. The conidia, when ripe, are distributed by the wind, and when they alight on the surface of another host plant under favourable conditions, germinate, and either form numerous zoospores, each possessing a single cilium, or produce several germ tubes which penetrate into the host plant and form a mycelium directly. This shows that the conidium is really a transformed zoospores, after swimming for some time in any moisture that there may be on the host plant, come to rest and also produce one or several germ tubes, as described for the conidia, from which the mycelium is formed. Occasionally, a conidium may give rise to only one short hypha, with a small lateral branch, which then bears two terminal secondary conidia similar to the original one.

Sexual reproduction takes place inside the tissues of the host. A short branch grows out from one of the hyphae of the mycelium and becomes very much swollen at the end. The swollen end then becomes separated from the hypha which carries it, by a cross wall. This swollen end is the *oogonium*, and contains the female portion of the sexual spore. While this is being formed, another lateral hypha arises near the first, and its tip is also cut off by a wall, though it does not swell up as the oogonium does. This is the male organ, or antheridium. The tip of the antheridium fuses with the side of the oogonium, and its contents pass into the oogonium and fertilize the egg. After fertilization, the egg cell surrounds itself with a strong thick wall and remains lying inside the old wall of the oogonium. These sexual spores are only liberated by the decay of the tissues of the host plant; this leaves them lying free on the surface of the soil. They are

able to germinate and reinfect another host plant as much as four years after their original formation. On germination, they form one or more short hyphae, which almost immediately produce conidia at their tips. This, then, is the life-history of *Phytophthora omnivora*, and that of most of the Oomycetes is very similar. The group includes many well-known parasites, as for example, *Pythium de Baryanum*, which causes the damping off of many seedlings, the grape mildew (*Plasmopora viticola*) and many others. It presents, moreover, a series of gradational forms, from the most elementary, as instanced in the Chytridineae, to much more elaborate ones, such as Phytophthora, and other members of the cohort Peronosporineae.

The Zygomycetes.—As an illustration of the life-history of one of the Zygomycetes, that of the Mucors may be described. These fungi are mostly saprophytes, living on many different substances. The mycelium closely resembles that of the Oomycetes, but the reproductive arrangements are somewhat different. In the asexual stage, erect hyphae are produced at right angles to the underlying tissue (substratum). These become swollen at the end, and the swollen portion is cut off by a wall, forming the spore-producing organ, or sporangium. The wall, then swells upward into the hollow of the sporangium, and give rise to a central portion, called the *columella*. The contents of the sporangium divide up to produce numerous minute spherical spores, which are liberated by the bursting of the sporangium wall, and are then distributed by the wind.

The other kind of spore is formed as follows:—The tips of two neighbouring hyphae become somewhat swollen, and each is cut off by a cross wall. They eventually touch one another and fuse at the point of contact, and their protoplasmic contents unite; in this way a simple form of fertilization is brought about. The spore, consisting of the two swollen end of the hyphae, becomes surrounded with a thick wall, and is isolated by the decay of the original hyphae from which it was produced. This group mostly contains saprophytes, in the cohort Mucorineae, but the other cohort included in the group, namely the Entomophthorineae, comprises several species of fungi of considerable usefulness from an economic point of view, as they are parasitic on several different insects, and under favourable conditions can keep then well in check. The same is probably true of one or two species of the genus *Mucor*, though these are not so numerous, or of so much use, as the species of *Empusa* and *Entomophthora*, in the group Entomophthorineae.

It may be of interest in passing to note that the characters, on which the families contained in the cohorts mentioned, are separated from one another, are mainly modifications in the form of the asexual fructifications, such as the amount of branching of the conidiophores, the shape of the conidia, presence or absence of a solumella in the Mucorineae, and similar characters. The species in the various groups are usually separated by much smaller differences, one of the most important being the size of the conidia, or of the spores, as the case may be.

This, then, concludes the description of the most primitive group of fungi, the Phycomycetes, whose forms show every stage of the development of sexual reproduction, from the conjugation of two similar cells to that of two sexually distinct organs, and also the adaption of the fungi to a land habit by the suppression of the earlier motile zoospores and the alteration of the zoosporangium into a conidium germinating directly, as is shown in *Phytophthora omnivora*, or in a different direction, by the alteration of the zoospores into non-motile air-borne spores, which is what would appear to have occurred in the development of the Mucorineae. In the next article, the numerous higher forms of fungi included in the group Ascomycetes will be discussed.—*Agricultural News*.

The Planters' Chronicle.

RECOGNISED AS THE OFFICIAL ORGAN OF THE U. P. A. S. I., INCORPORATED.

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THE U. P. A. S. I.

(INCORPORATED.)

The Scientific Officer.

Mr. R. D. Anstead, B.A., is likely to be on tour in the Nilgiris practically the whole of next month. Early intimation is given of this so that planters who wish to send in specimens of insects, &c., may endeavour to do so while the Scientific Officer is at headquarters.

The International Rubber Exhibition, 1911.

Intimation has been received that all Rubber exhibits intended for display at the International Rubber and Allied Trades Exhibition, 1911, must be shipped from the West Coast

NOT LATER THAN THE 15TH APRIL 1911.

Planters are reminded that exhibits should be forwarded to Messrs. Peirce, Leslie & Co., Ltd., Calicut, or Cochin, who will ship them to England.

The Indian Tea Cess Committee.

The Chairman decided that Mr. A. H. Mead should be nominated for appointment as a member of the above Committee (in succession to Mr. George Romilly) provided that he would promise to attend the meeting of the Committee at Calcutta on the 17th instant. Mr. Mead was asked, by wire, if he could do this. He replied that it was impossible. Efforts were made to ascertain the name of another planter who would be able to attend the meeting; but this also could not be done.

As the nomination of the U.P.A.S.I. would have to be followed by the issue of an order by the Government of India, further delay could not be incurred. Therefore, Mr. A. D. Jackson, of Messrs. Parry & Co., who is the representative of the Madras Chamber of Commerce and will be present at the meeting, has been asked, and has kindly undertaken, to represent the Association's interests in respect to the question of renewal of the Bonus on Green Tea. Mr. Jackson has already discussed the Bonus subject personally with Mr. Mead and Mr. Romilly, and is fully instructed.

Mr. Jackson is also willing to take up any other matter of special interest to South India planters in which they may wish their views voiced.

Honorary Secretaries of District Planters' Associations have been requested, if there are any such matters, to be good enough to communicate *direct* with Mr. Jackson, so as to obviate delay.

The nomination of a permanent representative of the U.P.A.S.I. for appointment to the Indian Tea Cess Committee has still to be made.

Scientific Officer's Papers.

LIV.—Plants and Beneficial Insects.

(Continued.)

Another class of insects are beneficial in a different way in that they feed directly upon, or parasitise, those insects which feed upon plants and do damage to crops.

In the course of ages, through which the present conditions of plant and insect life have been gradually evolved, a ratio between all existing animal and vegetable life has been established. There is a stupendous struggle going on all about us. There is a struggle among the plants as to which shall keep the ground, and we often see the strongest plants victorious, and taking possession of large tracts of country to the extinction of almost everything else; familiar examples in Southern India are the cases of the Sensitive Plant (*Mimosa pudica*) which is rapidly spreading in Coorg, and to which the late Commissioner there called attention, the Lantana, which has covered big areas in Mysore and elsewhere, and the Ichal palm (*Phoenix humilis* ?) which has grown over the pasture lands of South Mysore.

On plants numerous insects feed and are an important factor in determining the relative abundance of each species. To control the plant-feeding insects, and prevent them from exterminating plants altogether, Nature has provided enemies of various kinds for them which, in their turn, are checked so that they cannot exterminate the species on which they prey. Thus there has slowly been established a wonderful and elaborate system of checks and counter-checks, producing a balance between predacious, parasitic, and plant-feeding insects.

Here man has stepped in, and by his civilisation methods and agricultural operations has upset the balance, and he pays for this disturbance of Nature's ways by epidemic plant diseases, and the destruction of his crops in her efforts to restore things to the normal. By planting up large areas of one kind of plant to the extinction of everything else, man has favoured the increase of the particular insect which feeds upon that plant, and by cultivation he has destroyed the shelter necessary for the protection and encouragement of predaceous insects and animals with an insectiverous diet, such as birds, lizards, toads, etc. The true parasitic insects have not been so much affected by his operations, but the balance has been none the less disturbed, and the planter cannot depend upon parasites to keep down the injurious insects, since the action of a parasite is only to keep its host within certain limits, and if these limits still leave the host in sufficient numbers to become injurious to the crop the planter must himself do somthing to destroy it if he is to gain any relief.

Man has disturbed the balance of nature too by introducing new insects into new countries, and in many cases the introduced insect has found its new surroundings more suitable than those from which it was imported, and its natural enemies non-existent, and it has rapidly become a pest. The problem of preventing the introduction of pests and diseases in connection with the importation of plants has been considered in most of those countries in which the agricultural industries are of great importance, and legislation of some kind has been adopted to deal with, and prevent, this danger, and a similar scheme is now under consideration in India. (See *P. C.*, Vol. V/2. p. 504).

The possibility of importing parasites and predacious insects to destroy any given pest has, from time to time, been seriously considered, and during

recent years a great deal of work has been done on these lines with varying success. The difficulties encountered are, however, enormous. Some years ago an attempt was made to introduce Scale-eating Lady Bird Beetles into Southern India, but the attempt apparently resulted in a total failure.

Changes of climate make a lot of difference to insects, and when imported from temperate to semi-tropical countries, though surrounded by food, when liberated they wander away and die. This, apparently, is what happened to the Lady Birds introduced into India; there was plenty of food for them but they never bocame acclimatised.

Another important factor in the control of insect pests by means of their natural enemies is that the latter cannot eat up all their food supply, or else they in turn would die out. If they leave, as they must do, a small percentage on the crops their usefulness is much discounted.

As Mr. Froggatt pointed out in an Official Report after travelling all over the world studying the subject, "the ideal introduced parasite is one that can be bred in a large State, or in a private insectarium, in sufficient numbers to be distributed just at the critical time when the particular pest it destroys is in evidence; which when it is once liberated in the orchard and garden can establish itself against all comers in sufficient numbers, adapt itself to its surroundings, and, when its food supply is exhausted, or has reached the vanishing point, (a natural consequence if it is to be an effective parasite) will either find some other insect to devour, or will hibernate until fresh supplies come into existence."

The most successful case is that of the Australian *Vedalia*, which was imported into America to prey upon a Scale insect, *Icorya purchasi*, which was itself an imported insect, *Vedalia* being its natural enemy in its own country. This experiment was entirely satisfactory and serves to show what can be done under favourable circumstances.

Another way of making use of parasitic and predaceous insects is to encourage and increase the numbers of those which already exist. A large number of both these classes of insects exist in India whose hosts are well known insect pests, and schemes have been put forward for their protection and multiplication. Again, however, there are many difficulties in the way and progress is slow, and at present we are dependent upon insecticides, cultivation, and sanitation, to control and keep within bounds those insects which attack our crops.

RUDOLPH. D. ANSTEAD, *Planting Expert.*

"The triumph of the tea pot" is the subject of the following paragraph printed in the *Chemist and Druggist* from its Paris correspondent:—Miguel Lamacois chats pleasantly in the *Figaro* of the wonderful progress of tea-drinking in Paris of late years. A few years ago, he says, tea, with us, was nothing but a medicine. The tea-caddy stood in the family pharmacy, next to the bags containing borage and the "four flowers." Except a few dowager ladies and Anglican families, no one drank tea for pleasure. It was only used when the morning meal included lobster, or the late dinner a goose with chestnuts. It performed the office now delegated to the native chamomile—it was the confident consoler of digestive tragedies. And it would no doubt have remained indefinitely a pharmaceutical infusion—useful, but obscure—had not fashion and snobbism taken it up. Some modern Columbus discovered the English tea-table, and tea "came across the Channel more rapidly than the swimmers seem to be able to do." The national drinks, "insufficiently armed against this Yellow Peril," gave way, and now, "had it the virtues of the fountain of youth or the waters of Lethe, it could not be more ardently or greatly consumed."

Notes and Comments by the Scientific Officer.

96. *The Application of Lime.*—A Correspondent asks, "what period of time should be allowed between the application of Lime and artificial manures, and what is the safest minimum period of time in which Lime should have been in the soil before rain falls?"

Lime should never be mixed directly with any nitrogenous manures such as Fish, Poonac, Nitrate of Soda, Saltpetre, or Sulphate of Ammonia, and the same rule applies to fertilisers which contain free lime, such as Basic Slag and Nitrolim. The reason for this is that the Lime acts chemically on such bodies, seizing on the acids and setting nitrogen free as Ammonia gas which escapes into the air and is thus lost to the plant. Between applications of Lime and nitrogenous fertilisers a period of at least six months should be left, or the monsoon period. The best time to apply Lime is in the dry season; not only is it more easy to handle at that time, but it can be more thoroughly incorporated with the soil and covered up with the mulch, or worked in to the top soil. If applied in the dry season it will be quite safe to apply nitrogenous fertilisers after the monsoon is over; thus if it is applied in February and March nitrogenous fertilisers may be applied in September and October. It does not matter how long the lime is in the soil before the rain falls at all, in fact it could be applied in wet weather, but the practical difficulties of handling it then are great, or it may equally well be applied at the beginning of the dry weather when there are weeks without any rain before it. For further information upon this subject reference should be made to Scientific Officer's Paper No. IX in the *Planters' Chronicle*, Volume IV, page 314.

97. *House Flies.*—In the *Planters' Chronicle* Vol. VI, No. 2,—p. 24, an article on House Flies and Public Health was printed, and in the January number of the *Tropical Agriculturist*, Mr. E. E. Green, the Ceylon Government Entomologist, reports an interesting experiment of his showing what large numbers of this pest breed out from horse dung. Mr. Green bred out 37 specimens of the house fly from a ball of horse dung containing only about 4 cubic inches. As he points out," to prevent infection the manure should be kept in covered pits, or in closely shut barrels or bins."

In the January number of *Knowledge*, Mr. W. E. Collinge writes," Our grand-parents would have laughed at the idea of attempting to control such ubiquitous pests at house-flies; indeed there are still people who are unconvinced as to the seriousness of the part these insects play in every-day life; but, thanks to the excellent work that is being carried out at Cambridge and elsewhere, it will not be long before the public are not only convinced, but they will make themselves heard for drastic alterations that will tend to minimise the danger."

"Experiment has now actually demonstrated that the following diseases can be disseminated by the agency of house-flies; Anthrax, Cholera, Ophthalmia, Tuberculosis, and Typhoid Fever. In addition to these there are a number of diseases which are probably carried by flies, but the evidence, as yet, is inconclusive."

"There is now evidence sufficiently clear to show that, apart from disseminating the germs of the above diseases, flies also carry the eggs of parasitic worms and various species of fungi."

RUDOLPH. D. ANSTEAD,
Planting Expert.

THE PLANTERS' ASSOCIATION OF CEYLON.

Extracts from the Fifty-Seventh Annual Report for the year ending 31st December, 1910.

PLANTING PRODUCTS.

Tea

So far as prices are concerned they were satisfactory in the past season, more especially for medium and low-country teas.

Uva prices were not so high as they generally are in the months of July, August and September, accounted for by the continuance of showery weather through the South-West Monsoon, which however affected the yield favourably, and 1910 has given a record orop to Uva.

The yield of tea was not so satisfactory in other districts. The continuous showery weather from August to November, with cold winds, interfered much with the flush, and no doubt the growth of Rubber among the Tea in Kelani Valley and Kalutara districts has lessened the yields there. Prices generally are satisfactory.

The curtailing of the Tea area in the low-country may possibly be made up by the crops which will soon be coming in from the new Tea clearings in Uva and elsewhere, and generally in the Central Province from native clearings which the price of Tea encourages.

The total shipments amounted to 175,103,457 lbs. black and 6,597,360 lbs. green, compared with 185,797,366 lbs. black and 6,062,693 lbs. green in 1909.

Colombo Tea Report, 1910.

No very special feature has characterisd tea on the local market during 1910.

Nothing fine in quality or flavour has been sent from any of the districts. Nuwara Eliya teas maintained a very fair average, but the Uva flavour was, this year, a complete failure. Medium and low-country growths were useful.

It is advisable to note that where teas are without flavour the local demaud is for liquors with colour and fulness as against light and greenish liquors, also as the Russians have now come into the broken market a strong competition for "leafy" brokens has been produced.

The market was a very steady one throughout the year, only once did the average fall below 40 cents (26th January 39 cts.), while it reached an average of 45 cents for the months of March and December.

For the last 3 months of the year there was a steady rise in prices, especially for common sorts, and all qualities of dusts and fannings.

Total offerings were 80,156,158 lbs. against 80,303,558 lbs. last year. Actual sales 68,601,913 lbs. against 65,530,994 lbs. last year.

The average of local sales for 1910 was 43 cents compared with 40 cents in 1909.

Green Tea in 1910.

In reviewing the course of business in the Green Tea market the chief feature during 1910 has been the unprecedented demand from Russia. It will be remembered that from 1907 onwards shipments diminished from over two million pounds to the meagre quantity of half a million in 1909.

This year, however, shows an extraordinary increase in the consumption of about two million pounds over the latter figures.

On the other hand, the exports to America and Canada show a decrease of about a million—the reason being that the demand being greater than the supply prices were forced up to such an extent that buyers curtailed their operations to immediate requirements only hoping that they would be able to come in later.

During the first six months of the year the market pursued a remarkably steady course, any fluctuations being chiefly accounted for by variation of leaf, which was, as usual, somewhat poor during the busy months of June and July. In August, however, teas began to improve, and buyers discovering that crops would be below the estimate forced prices up to a higher average than has ever been recorded before, and at the present moment there is practically no difference in the price of low or high-grown teas.

Remunerative as the year must have proved to producers, it is gratifying to be able also to take an optimistic view of future prospects. It may be confidently predicted from the record prices that low-country crops have been purchased for 1911, that next year will show a considerable and permanent expansion in business.

There has been no marked increase in the manufacture, which is no doubt partly due to the fact that the bulk of Green Tea is sold by private treaty. However, when the present position is better known, it may result in more attention being paid.

The quality of the crop has, on the whole, been good and the high standard of manufacture has been maintained.

Attention, however, must be called to the grading. Probably owing to the scarcity of tea and the high prices ruling too little care has been exercised, with the result that all grades have contained, in many instances, too much broken leaf and fannings; whilst in order to obtain as large a percentage of Hyson as possible, a considerable quantity of Young Hyson leaf has been noticeable in this grade.

It would be a matter of regret if any secondary consideration is allowed to interfere with a business that augurs so well for the future, and it is to be hoped that producers will realise this important fact.

The estimated Tea Crop for 1911 is 183,000,000 lbs. distributed as follows:—

			lbs.
United Kingdom	...	...	103,000,000
Russia	...	...	25,000,000
Other Countries in Europe	...	...	3,000,000
America	...	...	17,500,000
Australia	...	...	23,250,000
Africa and Mauritius	...	...	2,000,000
India	...	...	1,250,000
China and Singapore	...	...	8,000,000
	Total	...	183,000,000

RUBBER.

The earlier portion of the season was phenomenally dry, but the late advent of the S. W. Monsoon was followed by excessive wet weather in the closing months of the year. The estimated crop, however, has generally been realized.

Fungoid diseases have been much less noticeable during the past season, and cultivation by manuring has been more generally adopted with excellent

results, both as regards bark renewal and improved vigor in the appearance of the trees.

With rapidly increasing crops to be harvested, the complaint from manufacturers of the want of uniformity in Plantation Rubber, originating in the difficulty of satisfying buyers' requirements from any one estate in quantity, will, it is anticipated, very shortly disappear. It is satisfactory to note that manufacturers have expressed themselves as satisfied with Plantation Marks they have become accustomed to, and can buy in quantity.

The highest price realized during the year at the London auctions was *12s. 8½d.* In April—Hard Pará realizing *12s. 6d.* on the same day. . . .

The shipments for the year were 3,586, 854 lbs., as against 1,492,590 lbs. for 1909.

COAST AGENCY.

Your Committee are pleased to be able to report that there has been a very satisfactory increase in the number of coolies passing through the Agency in 1910, and also a marked increase in the proportional rates which work out at so high a figure as 60 per cent. of the total number of immigrant coolies from all parts to Ceylon during that period, the latter fact lending additional force to the claim for renewal of the Government contribution.

The number of estates directly employing the Agency is also largely on the increase. Expenditure, however, is very heavy, and in view of the proposed expansion of the work of the Agency, which is generally recognized as expedient, this expenditure must continue to rise.

An additional European Assistant Commissioner has been appointed, dating from the 1st of January, 1911.

It is of the first importance that the number of Agencies and also the number of Assistant Commissioners should be further increased, both to enable the Commission to extend operations over new areas of labour supply, and also to secure closer supervision of the methods of recruiters and the limitation of recruiting fees to a reasonable figure and, if possible, a uniform rate.

Meantime additional funds are urgently needed to meet the increase of expenditure.

Your Committee has therefore recommended that the Cess shall be increased from 15 to 30 cents per cultivated acre, and it is hoped that the subscribers to the Fund will unanimously support this proposal.

Your Committee are taking special measures to ensure economy in the administration of the funds of the Agency while providing for any outlay, within its means, likely to increase its efficiency.

LABOUR AND THE AMENDING ORDINANCE NO. 9 OF 1909.

The Labour Ordinance has on the whole worked smoothly for the past year.

Serious attention is being given to the need of checking false statements made by coolies to the Superintendent at Ragama, and also to the facility with which coolies obtain certificates from Magistrates on false affidavits as to previous employment.

"THIRTY COMMITTEE."

Owing to the cessation of the Cess the funds at the disposal of the Committee are so reduced that it has been decided to suspend operations in America, but a propaganda on a reduced scale is still being continued on the Continent.

tion of 6,000 feet. The bulk of the rubber exported from the Protectorate has hitherto been obtained from these vines. In the Coast Belt much damage has been done to the vines by the native methods of tapping, but attempts are being made to remedy this.

Within the last two years *Mascarenhasia elastica* was found to be indigenous in the forests on the Shimba Hills, and experiments are now being made in order to determine its value as a source of rubber and its suitability for planting purposes.

Experiments are also in progress with Pará, Ceará, Funtumia and Castilloa rubber trees. Except in a few favoured situations, the climate of East Africa, even in the Coast and Lake regions, is not suitable for the Pará tree. The Ceará tree has, however, done very well, and plantations aggregating from 1,500 to 2,000 acres have been already established, and extensive planting is going on.

Rubber Cultivation in German Colonies.

M. Cayla publishes in the *Journal d'Agriculture Tropicale* an account taken from different numbers of the *Gumme-Zeitung* of the progress of rubber cultivation in German Colonies. The Germans have developed enormous activity in extending the cultivation of rubber in the Colonies in Africa and the Pacific. In 1908 there was a fall off in production of wild rubber from Africa due to the low price which did not pay the native collectors, and a spell of excessive dryness reduced the flow of latex. The total export for 1908 was in round numbers 1,57,770 kilos worth 6,400,000 marks against 1,900,000 kilos worth 10,8000,000 marks in 1907. This came all from Africa except 6,000 kilos, from New Guinea. Most of it was exported from the Cameroons, and the diminution in the amount of rubber brought in, in the certain localities suggests that the Funtumias are dying out.

In the matter of cultivation *Hevea* is tried everywhere, but the greatest area is in Samoa, where it is cultivated with cocoa, in equal proportions. There are about 400,000 Heveas, of from one to five years old in Samoa. It is also planted in New Guinea, but, apparently *Ficus elastica* is preferred there.

Castilloa cultivation is not being extended in New Guinea, 240 hectares being lost by tapping. In Africa it is being continued but it appears that the strain at Amani is a bad kind.

The cultivation of Funtumia is largely developed in the Cameroons with varying success according to local circumstances. *Ficus elastica* grows well but slowly at Amani. *F. Schlechteri* grows better but does badly in the Cameroons. Experiments in *F. Vogilli* at Togo confirm the inferiority of the latex. *F. Rigo* of New Guinea gives hopes of success in Samoa.

Manihot glaziovii is the only rubber cultivated in East Africa. A new method of tapping two year old plants was tried, and, what is hardly astonishing, gave very poor rubber. It is freely condensed for the Cameroons, as giving no prospects of returns.

Manihot of Bahia and *M. Piauhyensis* tried everywhere in Africa have shown no advantages over *M. glaziovii*, *M. dichotoma* seems to be a little better at Togo. There are some cultivations (95 hectares) of Landolphias in East Africa, and *Euphorbia fulva*, "Palo Amarillo" at Amani grows very slowly.

The Guayule is being cultivated in the South West. The plants are a year old and doing well. Gutta percha, *Palaquium oblongifolium*, has been tried everywhere but no results are given. *Payexa Leerii* failed in the Cameroons.—*Agricultural Bulletin of the S. and F. M. S.*

SELECTED CUTTINGS.

Fungus Notes.

The Chief Groups of Fungi.—PART IV.

The Ascomycetes.—The next group of fungi to be considered is the Ascomycetes. These fungi all possess a mycelium which is divided up by transverse walls, and they are characterized by the formation of a sac, or ascus, in which a definite number of spores, usually eight, is borne. The whole group may roughly be divided into the following sub-groups:—Protoascineae, Protodiscineae, Helvellineae, Discomycetes, Tuberineae, Plectascineae, Pyrenomycetes.

This division is more or less a rough one, and in fact, there are so many classifications of the Ascomycetes on different lines that it is a matter of some difficulty to choose between them.

As has been stated previously, the bulk of the evidence which has accumulated during recent years would tend to show that the asci were originally formed as the outcome of a sexual process. In some genera, an organ corresponding to the oogonium of the Oomycetes, and another similar to the antheridum in the same group, have been found to exist, and in some cases an actual fertilization process is known to occur. In many genera, however, the process has become obsolete, or modified in one way or another, so that it differs considerably from its original form. The scope of this article does not permit of a further discussion of this question, which is one of very great complexity.

The Protoascineae and Protodiscineae.—In these groups, the asci are produced over the whole mycelium, or sometimes from a special part of it, but are not enclosed in a particular form of covering, consequently there is no very definite fruit-body by which the members of the groups can be recognized, as the asci are in most cases borne free on the surface of the host-plant. These fungi often cause various malformations of the host, such as witches' brooms of many trees, especially in the temperate zone, leaf curl, leaf blisters, and malformations of fruits, with which the genera *Exoascus* and *Taphrina* are so frequently associated. The asci are usualy short and more or less cylindrical. They are produced from hyphae growing in the outermost wall of the epidermis of the host, known as the cuticle. They grow out at right angles to the surface of the host, bursting the cuticle as they develop. The fungi known as yeasts belong to the first of these groups.

In all the other members of the Ascomycetes. the asci are borne on definite fructifications, either open when ripe, so that the asci are freely exposed to the air (*apothecia*), or in the form of closed, often spherical, masses, which decay and so liberate the spores (*cleistothecia*), or in boxes with some definite method of opening by means of a lid or pore at the top (*perithecia*). Both the apothecia and perithecia are often carried on some form of stalk or supporting arrangement built up from the hyphae of the fungus, or, in some cases, are borne on, or sunken in, a special mass of closely woven hyphae known as a stroma. In other cases, the fructifications are originally sunken in the host plant and only break out on the surface when ripe or nearly so.

The Helvellineae.—In this group, the fructifications are usually erect and fleshy, though they may be of various forms. They are generally lobed, or wrinkled, and bear the asci all over their upper surfaces. Some of the species are edible, as for instance, some in the genus *Morchella* (morel). Others are suspected of being parasites.

The Discomycetes.—This group of fungi is characterized by having its asci produced in fructifications known as apothecia, mentioned above. The fructifications are more or less cup-shaped when ripe, and either borne on a stalk of sterile interwoven hyphae, or are sessile on the underlying substance (substratum); the asci are borne over the whole of the hollow upper surface, and at right angles to it. Between the asci are numerous free hyphae, often somewhat swollen at the end. These are known as hairs, or paraphyses. The asci and paraphyses often give the inner surface of the cup a smooth or somewhat gelatinous appearance. When young, the apothecia are closed, and consist of an outer covering layer of closely woven, sterile hyphae, from which the paraphyses spring, and an inner layer of special hyphae from which the asci are produced. The fructifications, when young, may be immersed in the substratum, but become free when ripe, and open out to form the cup-shaped structure already described. The group is further sub-divided by the characters of the apothecia—whether immersed in the substratum when young, or free from the start; whether sessile or stalked, black or coloured, and similar points. The spores are usually forcibly extruded from the asci by the mutual pressure of the asci and paraphyses. They may be of different shapes, from oval to linear, one or more celled, colourless or coloured, transparent or opaque; and such characters serve to differentiate genera and species. . . .

The Tuberineae.—The fructifications are closed, or nearly so, and consist of a more or less solid mass of tissue, often penetrated by channels in which the asci are produced. The spores are liberated by the rotting of the ascus. The channels in the closed fruits often lead in the direction of a portion of the surface, only covered by a very thin layer of tissue, which breaks down and liberates the spores. In some cases, the fructifications are open entirely; in others, very thick layers surround the whole cleistothecium. These characters serve to subdivide the group. The asci are usually only 4-spored, and the spores are often spiny. All the fructifications are borne underground, some of them being edible and known as truffles.

The Plectascineae.—In this group, the fructification is again a cleistothecium, very minute in size, and consisting of a mass of tissue, in which are hollows where the asci are produced; each ascus is often separated from the others by a mass of soft tissue, or the asci are formed in irregular lines. The fructification may be of a fairly soft, fleshy consistency, and coloured, or black and hard outside, though softer and colourless within. This group includes the black fungus prasitic on scale insects (*Myriangium Duriaei*), and the genus *Meliola*, one of the black blight fungi. . . .

The Pyrenomycetes.—Here the fructifications are perithecia, or hollow boxes, in which the asci and paraphyses are produced. They may be superficial, or immersed in the substratum, borne simply on, or in, a stroma; they may be of differnt colours and different consistency. The asci usually contain eight spores, which are unicellular or multicellular, coloured or colourless, and of many different shapes. All these characters are of value in subdividing the groups. For instance, in the Perisporiales, the perithecia open with a lid, or simply decay. In the Hypocreales, Sphaeriales and Dothideales the spores are extruded, when ripe, through a pore at the top of the perithecium.

In the Hypocreales, the perithecia, and stroma when present are fleshy and coloured. In the Sphaeriales, they are black and hard, either scattered and superficial, or grouped in a stroma. In the Dothideales, the perithecia are simply hollow spaces in the black stroma. . . .

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THE U. P. A. S. I.

(INCORPORATED.)

The Planting Member of Council.

The Hon'ble Mr. J. G. Hamilton visited the office yesterday, and left this morning for Madras, where he will attend the Meeting of the Legislative Council of Fort St. George, besides calling upon certain officials in order to discuss with them matters of importance to the planting community.

In particular, Mr. Hamilton hopes to be able to give personal support to the representations made to the Government of Madras on the subjects of the Proposed Coffee Cess and Proposed Legislation for the Prevention of Thefts of Planting Products. These two subjects are of very great importance, and the first of them has to be submitted for the consideration of the Government of India. It is hoped that the Madras Government will see their way to send the U.P.A.S.I. proposal on with an expression of approval. As regards the prevention of thefts of produce it remains to be seen whether the Government of Madras will be prepared to introduce a Bill dealing with the matter or if they will ask the planting community to arrange for the introduction of such a Bill.

"The Times of Ceylon."

From the 1st instant the above contemporary has been publishing daily *a Special Southern India Supplement*, giving the day's telegrams and the Colombo Brokers' Association share list. This supplement is issued in time for despatch by the mail boat of the day and gives Southern India subscribers the latest Reuter's telegrams as well as the latest share market news.

Advertising in the United Kingdom.

A copy of Mr. A. E. Duchesne's report for December 1910 has been kindly sent to the Secretary, U. P. A. S. I. It reads as follows:—

"*Advertising.*—The general advertising is proceeding along the usual lines. I am gradually substituting copy of a more reasoned character for the display blocks on which we have hitherto chiefly relied. I have placed advertisements with the 'Festival of Empire' for their preliminary booklet, and with the *Weekly Dispatch* for their yearly Home Book. Each of these will reach a wide and influential circle of readers. A large number of articles and paragraphs have been inserted, among them illustrated articles in *Lewis' Magazine* and the *Grocers' Journal.*

"*Shop Bill.*—I have had printed 3,000 copies of a shop bill. Of these 1,600 have already been distributed, among 471 tea-dealers.

"*Folder.*—The printing of this is now nearly complete and 500,000 copies have been allotted. The great feature about this has been the assistance we have obtained from the leading wholesalers, who have energetically

pushed it among their customers. I append a list, showing its distribution, and also a copy of the Folder. The following letters from large firms of wholesalers show that the folder is much appreciated by them.

'Would it be possible to get another 20,000 of these Folders, they are really splendid?'

'*Folders.*—I will have them out at once and hope to derive much good from them. I consider them a splendid form of advertising.'

"*Post Cards.*—I have now distributed 205,000 coloured post cards, and as my stock is exhausted, I am having a fresh 100,000 printed.

"*Festival of Empire.*—The question of an effective exhibition at this is being considered, but nothing definite can be done till we know whether there will be sufficient funds at our disposal."

Specimens of advertising matter have also been received, along with various press-cuttings. Extracts from one of these, which takes the form of a critical review of the Indian Tea Association's advertising campaign as a whole, are given on page 92 of the current issue.

"Coloured" Tea.

Apropos of the meeting of the Indian Tea Cess Committee on the 15th instant the following information from Washington, U. S. A., will probably interest tea planters:—

As the result of a conference between representatives of the Agricultural Department, members of the Tea Board and customs officers in New York, the Treasury Department to-day issued instructions for marking tea to officers of the customs in accordance with the wishes of the Agricultural Department.

Both the Treasury Department and the Agricultural Department have certain duties with regard to importations of tea and the provisions of the Tea Inspection Act of March 2, 1897, and the Food and Drugs Act, respectively. Under the former the Secretary of the Treasury is required to appoint a Tea Board, which shall designate standards of tea, and the Secretary must see that all importations of tea conform to these standards. Under the latter provision the Secretary of Agriculture has supervision over all importations of tea as well as other food and drug products in regard to their purity and proper labelling, etc., and therefore can require that all artificial colouring must be plainly indicated.

The following instructions are, therefore, the result of collaboration between the two departments:—

"To collectors and other officers of the customs—

"At the request of the Secretary of Agriculture and upon his representations as to the necessity therefore under the Food and Drugs Act, the Department has decided to co-operate with his Department to the end that packages of tea artificially coloured or faced shall be so labelled. I am advised by the Secretary of Agriculture that beginning May 1, 1911, all tea thereafter imported into the United States, both in large and small packages, must be labelled on each container to show the presence of any artificial colouring or facing matter therein.

"This regulation will not apply to teas imported prior to May 1, 1911.

"It is expected that such examination as the Department of Agriculture desires to make under the Food and Drugs Act to determine the presence of such foreign matter will be made simultaneously with the examination under the tea inspection act of March 2, 1897, in order that there shall be the least possible delay to shipments. Should special regulations be

required to minimise any inconvenience to importers and to secure harmonious co-operation between the two departments under the two laws governing the importation of tea you will be duly advised."

Valorization Coffee.

It has been decided by the Bankers' Committee that 1,200,000 bags of Valorization Coffee shall be offered for sale in April next, the distribution of the sales in the various markets where stocks are held being in proportion to trade requirements.

This is the total quantity to be sold during 1911, and the sales are to be effected between the 1st and the 30th April 1911.

The total amount of Government Coffee held in Europe and the United States is estimated at 6,320,000 bags.

The official programme drawn up in January 5, 1911, reads as follows:—

"A meeting of the committee charged with the management of the State of Sao Paulo Government coffee was held to-day under the chairmanship of Baron Bruno Schroder, and the following members were present: Dr. Paulo Da Silva Prado, M. le Vicompte Des Touches, The Société Generale, Herman Sielcken, the firm of Theodor Wille, Edouard Bunge, the firm of J. Henry Schröder & Co. The following statement was approved: (1) With reference to clause 6 of the circular to the coffee trade, dated January 6, 1910, the committee states that 1,200,000 bags of coffee will be sold between the 1st and 30th of April, 1911, and that no more Government coffee will be sold during the current year. (2) The sales will be made in all the different coffee markets where the Government stocks are now stored, and will be distributed in proportion to the requirements of those centres. (3) The committee will announce the intended sales for 1912-13 early in 1912."

It is interesting to note that as compared with the circular of the previous year the above statement is more concise and clear. The programme for 1910 given out January 6 reads:—

"1.—With reference to clause two of the circular dated April 27, 1909, dealing with the proposed alteration of the law limiting the export of coffee, the Government of the State of Sao Paulo has informed the committee that the proposal has been withdrawn.

"2.—With reference to clause three of the circular dated January 5, 1909, the committee states that 500,000 bags of coffee will be realized gradually at market prices between the period of February and June, 1910. The first sale of 125,000 bags will take place in the first half of February. The committee will inform the public of the sales of the above 500,000 bags as soon as the sales have been completed.

"3.—No further coffee will be sold during the year 1910 unless the tendency of the market and the requirements of the trade should, in the opinion of the committee, render such further sales advisable, but in any case such further sales will not exceed 600,000 bags. The committee will select the best markets.

"4—600,000 bags of coffee shall be sold at market prices during the period of January to July, 1911.

"5.—In case the 600,000 bags of coffee mentioned in clause three or part thereof shall have been sold, the committee may at its discretion cancel the sales of the 600,000 bags or parts thereof mentioned in clause four.

"6.—The committee will announce the intended sales for 1911-12 early in 1911."

Scientific Officer's Papers.

LV.—Second Tour in the Anamalais.

I arrived in the Anamalais on 14th January and made a tour of the district, addressed a meeting of the Planters' Association on 27th January, and left the district on 28th.

On the occasion of my last visit, in June 1909, my attention was called to a disease of coffee which caused individual trees, especially after a heavy crop, to drop their leaves, sicken, and often die. This was popularly put down to overbearing, but, I suggested at the time that it was more probably caused by root disease. Since then I have visited most of the Coffee districts in South India and have found this disease prevalent in all of them, and it is undoubtedly caused by Stump rot. I have written a great deal about this disease in the *Planters' Chronicle* during the past year, and I would refer those interested to former reports. There can be little doubt but that it is a most serious disease and one which it is almost impossible to cure; preventative methods alone can be adopted. A series of experiments were tried at my suggestion during 1910 to test the effect of pruning and stumping, and various manures on trees attacked by this disease. The trees under experiment have unfortunately been recently destroyed by fire, but I understand that the results previously obtained were practically nil, in fact a tree once attacked very seldom makes a good recovery. The effect of a dressing of Ferrous Sulphate was also tried with the idea of killing off the fungal hyphae in the ground, and on dead wood, before they could gain an entry into the coffee roots. Variable results have been obtained; in most cases there was no benefit to be seen from this treatment, but in some cases it apprently saved attacked trees. It was agreed to give this fungicide a further trial on definite areas this year.

The only efficient remedy is to uproot as many stumps of dead trees as possible. When a shade tree is killed for any reason the stump should be isolated by a trench dug at the time the tree is killed, or better still it should be uprooted. Uprooting does not mean that every root in the soil must be got out. Fungi, as a rule, begin to grow on the stump left above the ground surface, and to prevent the disease spreading to the surrounding crop, the stump and as much of the main root as possible should be extracted to a depth of about two feet. If more can be got out so much the better.

Root disease of Tea is common in the district, but can be isolated and controlled by a system of trenches, especially if these are made at the beginning of the attack. Dead bushes should be uprooted and burned, and when *Grevillea*, especially, is killed the stumps should be removed, as this tree always starts the disease in Tea. Lime should also be freely used on affected areas. The same disease attacks Pará and Ceará Rubber, and isolated trees die suddenly. On examination these will be found to have a rotten tap root and at the collar a mass of earth and stones cemented to the stem by a black charcoal-like mass. This disease is easily recognised and very typical, and caused by a fungus which Petch names *Hymenochoete noxia*. Such trees should be dug out and burned, and the soil round them forked up and treated with lime before a supply is planted.

The district appears to be eminently suited to the cultivation of Tea, and with the exception of Stump Rot and a little Mosquito Blight, tea diseases are conspicuous by their absence. The latter attacks Cinchona, and I should advise growers to remove all the Cinchona from their tea clearings. A wilt disease occasionally occurs in the nurseries and kills the

young plants, and the same, or a very similar, disease kills the young plants when they are put out in the field unless they are shaded. The disease in the nursery also attacks young cardamom plants. The fungus attacks the seedling at the collar and kills the bark just above the ground and for a short distance up the stem, finally ringing it and attacking the wood and thus preventing the upward passage of water to the leaves, which then wilt and turn yellow, and finally fall of, and the plant dies. The passage of food from the leaves to the roots is stopped, and the upper part of the stem becomes thickened and a collar is formed above the diseased area. The fungus causing this disease is probably a species of *Fusarium*, and Mr. Petch, the Ceylon Government Mycologist, a short time ago recommended the following method for controlling it:—"The surface of the seed bed is sprinkled with sand immediately after the seed has germinated. Clean sand of rather coarse texture should be used and applied as hot as it can be handled, sprinkled over the surface to a depth of about one sixteenth of an inch." Other methods of control may be used. As soon as the disease appears the shade should be lightened as much as possible and all the attacked plants should be pulled up and burned, and a layer of charcoal may be put down. This has been found in some cases to give good results. Patches from which dead plants have been removed may also be watered with Jeyes fluid, one ounce to a gallon of water, which will check the spread of the disease. Old nurseries which have been used several times should have lime worked into the top soil before they are used again.

The same ground is often used for nurseries continuously, on account of its convenient situation near water, and in this case it should be thoroughly worked between the sowings, and lime applied to it. Preferably it should be sown down with some other crop, such as a legume, before being used as a nursery again. If seedlings have been destroyed by a disease it is useless to expect a subsequent healthy growth on the same ground without a thorough working of the soil, and the application of some disinfectant.

The Rubber in the district, taking into consideration the elevation and rainfall, appears to be making satisfactory progress. The growth of Pará is slow, but of Ceará remarkably rapid. I had an opportunity of seeing some of the latter being tapped, and if attention is paid to careful and thorough washing there is no reason why good rubber should not be made. Pink disease is to be found on the Hevea, and it was also noticeable on Camphor and Jak trees. In most places, however, it is regularly cut out, and I understand that this year the trees, on some estates at any rate, are to be painted with Bordeaux mixture as a preventative. This treatment should undoubtedly be adopted, since very good results have been obtained from it where it has been experimented with on a large scale.

Weeds still continue to be a problem, but some promising results have been obtained by the experimental use of leguminous green dressings. The commonest indigenous legumes suitable for the purpose appear to be *Crotalaria retusa*, *Desmodium polycarpum* and *D. rufescens*. These Desmodiums are apt to grow up very high when they are about to flower, but at this time they should be cut down and spread out as a mulch. The plants themselves form a dense carpet and effectually prevent the growth of weeds. *Tephrosia purpurea*, raised from seed supplied from the U. P. A. office, has also made a satisfactory, growth and the germination of this seed, in the Anamalais at any rate, appears to be so good that it is probably unnecessary to treat it with Sulphuric Acid previous to sowing. For Rubber, however, the Dadap, which grows very freely in the district, is the best cover

crop to use. The Suckers should be bent down to make them cover the ground at first, and future crops of suckers should be cut off and laid on the ground to form a mulch.

On the occasion of my former visit some manurial experiment plots were arranged, but unfortunately these experiments were not carried out. On this occasion I was enabled to supervise a most interesting experiment with Nitrolim as a fertiliser for Coffee. The Nitrolim was mixed with nine times its bulk of dry earth and then applied at the rate of 2 oz. per tree. The mulch was first of all removed and raked up round the trees, the Nitrolim mixed with soil was then broadcasted round the trees and lightly pricked in, and the mulch was finally spread evenly over it. The cost of application was somewhat high but the benefit to be obtained by applying fertilisers in this way is probably worth the extra cost. It will be extremely interesting to see what effect this new fertiliser has upon Coffee. Experiments which have been so far made with it have been conducted in Europe and America with grain crops, and the only way to discover what value it has as a fertiliser for Coffee and Tea is to try it.

Now that the prices of Poonacs and Bones are rapidly advancing more care should be taken of the natural manure of the estates. This is all the more important in a district like the Anamalais where transport of artificial fertilisers from the nearest point on the Railway is a big item. Coffee pulp if properly conserved and made into a compost will prove a valuable manure, and it is much better to use this waste product in this way than to allow it to ferment and dry and then put it out as a mulch. What is needed is a watertight tank of some kind into which each day's pulp, after being allowed to drain, can be put. On the top of it should be spread a layer of yard and line sweepings and occasionally a little powdered bone should be added at the rate of about 1 cwt. for each ton of compost. All the ashes from the lines, the cattle manure and litter where carts have camped, leaves and rubbish generally about the yard should be collected and added to this compost heap. When the tank is full a layer of earth should be put on the top and a cover erected over it to keep off the sun and to protect it from the wash of the monsoon rains. By September it will have all rotted down to a valuable manure which may be applied to the Coffee at the rate of about a ton or more per acre. The light soils of the Anamalais undoubtedly require organic material added to them, and fertilisers like the above will in all probability have a greater effect than artificials.

It is not possible to judge the effect of a manure from one year's application only, but if a compost is applied year after year for several years I feel sure that its good effects will soon become apparent.

Cardamoms are an important industry in the district and the indigenous variety, (*Elettaria cardamomum*) is being largely replaced by the upright Ceylon variety (*E. major*). As far as the Anamalais are concerned there appear to be at present no diseases of this crop, but elephants do a tremendous amount of damage, and some arrangement is badly needed to allow planters to protect this industry from their ravages.

My sincere thanks are due to Mr. Marsh for his generous help with my transport arrangements, and to all the planters in the district for their kindness and hospitality.

RUDOLPH D. ANSTEAD,
Planting Expert.

Notes and Comments by the Scientific Officer.

98. *Treatment of Stump Rot in Coffee.*—A correspondent writes me to say that he is following my advice with regard to the treatment of patches of Coffee attacked by Stump Rot (See *P. C.*, Vol. V, p. 562) and has begun a campaign against the disease. He thus describes the process :—

"To begin with I am demarcating all the bad patches which will be dealt with as you advised as opportunity offers. Two fields I am dealing with now. I have made two-foot trenches round the patches, have applied caustic lime to them at the rate of two tons per acre, and have started digging them two feet deep, removing and burning all the coffee tree roots and dead stumps, leaving only the shade trees and shade plants. After the monsoon, say in August, I propose to replant these patches."

The cost of this work is estimated at about Rs.104 per acre, including the lime, at this time of year. The work could be done much more cheaply if the ground were soft, and this raises the question of the best time of year to do it. My correspondent says, "No doubt this season of the year, for many reasons, is the most favourable for this work ; there being no rain, and the air being dry, the Lime is applied in its most efficient state ; the soil, which in the course of deep digging is thoroughly turned over, is exposed to the scorching rays of the sun which doubtless have a purifying effect ; the crop has just been picked, and one has not to dig out trees with actual berries on them. But, on the other hand, deep digging at this time of the year is a very hard work, which means that it is not only expensive, but that it is difficult to get our malaria-enfeebled coolies to do it at all."

As an alternative the following plan is suggested as being more practical :—

"Dig the patches deeply, removing the coffee trees, stumps, roots, &c., soon after the S. W. monsoon, while the ground is soft, then get the lime up with the return crop carts about February, apply and mix it with the already dug soil, and replant in August."

This appears to me to be the best plan of all, as the land is fallow for a long period, and it implies a second light dig in February when the lime is applied, and this will stir up any fungus left in it and bring it into contact with the lime, which can be more intimately mixed with the soil by this method of application. The cost of the work will be reduced also, to about Rs.85 per acre. In both these estimates the cost of the demarcating trench is included.

Another interesting point is raised by my correspondent. He writes, "I find that it is a very difficult matter in isolating the patches, to know where to stop ; one finds trees which, though they may not have lost their primaries, and may not be loose in the ground, are evidently sickly, but at the same time have a fair spike and are capable of bearing a considerable crop."

Around the stump rot patches there is undoubtedly a zone which it is difficult to treat. This is the region where the fungus is growing forward and beginning its attack upon new trees here and there. The real method of treatment, which may not, however, be practicable but should be taken as a standard to be worked to as closely as possible, is to have two zones treated differently.

At the centre is the bad patch, this is forked up and limed ; next comes an isolation trench, then surrounding the central patch a zone some five rows of trees wide which is doubtful. This should be treated on the surface with Lime, and manured ; outside this again is another isolation trench.

This surrounding zone is thus isolated, and it must be watched. It may be cured, but it may, on the other hand, soon show signs of the presence of the disease, when it must be rooted out and treated like the inner plot. It is isolated and so if it developes the disease it will not be able to spread outward to the surrounding healthy coffee or inward to the already treated central region. In this way one would get a crop from the isolated zone and also stand a chance of saving trees which are doubtful and have a good spike. It is very difficult to decide about the trees on the outskirts of a bad patch, and very difficult to detect the fungus on them at the beginning of an attack. The point attacked first is often the small hair-like feeding roots which are all killed off, thus making the tree drop its leaves and look sickly. If such a tree is dug up there is little to be seen except that there are no feeding roots, and the fine roots are usually broken off during the process of uprooting.

The method of treatment here described is expensive, but it is better to adopt drastic methods than to waste time and money annually on unsatisfactory curatives and be left at the end with still unhealthy and diseased trees.

99. *Unlabelled Specimens.*—From time to time specimens of insects and diseased plants are received with nothing to show from whom they come or what is required. Only recently a neat little package of parchment coffee arrived with nothing whatever to explain its existence. I do not know whether in these cases the covering letters have gone astray, or whether they have never been sent, but it almost appears as if it were necessary to point out that samples of any kind sent to this office cannot be attended to unless they are accompained by a covering letter giving full details and descriptions of them. The samples themselves should be labelled distinctly and have the name and address of the sender attached to them so that he can be communicated with should no covering letter arrive, and thus possible disappointment be avoided and the charge which, under similar circumstances, was once made at a Planters' Association meeting that no answer could be got from the Scientific Officer.

RUDOLPH D. ANSTEAD,
Planting Expert.

ADVERTISING INDIAN TEA.

The *Advertising World* reviews "the Campaign that is being conducted to win increased popularity for Indian Teas in this country." *Inter alia*, it remarks:—

"We were enabled to see that with limited means the advertising department of the Indian Tea Association is doing much good work. The funds available for the year under review amounted to no more than £4,000, an increase, by the way, of £2,000 on the preceding year. . . .

"The chief aim of the Indian Tea advertising has been to interest the retailer. Direct appeals to the public, through the Press or otherwise, have been considered, rightly or wrongly, of comparatively minor importance . . . but more valuable has been a systematic personal canvass of the traders in important centres throughout the country. . . .

"Within the limits imposed, partly by time, but more as we should surmise by financial considerations, the personal canvass of leading retailers has been conducted with vigor and thoroughness. In a case such as this, to gain the suffrages of the retailer must be of prime importance, and no part of the time, trouble and money expended in this direction can be looked upon as wasted. Indeed, to our mind, it forms the strength of the campaign as it stands.

DISTRICT PLANTERS' ASSOCIATIONS.

Kanan Devan Planters' Association.

Minutes of the Bi-annual Meeting held in the Munnar Club, on Saturday, the 7th January, 1911.

PRESENT.—Messrs. J. C. Abbott (*Chairman*), H. L. Pinches, W. A. Lee. A. J. Imray, W. J. Dixon, A. J. Wright, J. C. Swayne, M. C, Koechlin, C. Fraser, W. O. Milne, A. Yates, A. Blair Hill, G. W. Cole and E. A. Hughes (Honorary Secretary).

The notice convening the Meeting having been read, the Minutes of the last General Meeting were taken as read and recorded.

AGENDA.—The recent increase in the Travancore Tobacco Duties.

The State of the Northern and Western Outlet Roads.

The Case of Suppan Kangany.

Labour Rules.

The Munnar Post Office.

The Bodi Mettu Ghat Road.

The Meeting discussed the recent increase of the Tobacco duty. It was felt to be a hardship, as all English and Foreign Tobaccos had already paid duty on entering British India.

The following Resolution was proposed by Mr. Wright and seconded by Mr. Pinches :—

"That the Government be approached and repectfully urged to grant a rebate with retrospective effect, and to withdraw the Travancore Import Duty on all Tobaccos, Cigars and Cigarettes (other than those of British Indian manufacture), which can be proved to have paid duty into British India. Owing to the situation of the District all imports passed through British India, and the payment of the double import duties at present involved, have raised the average price of Tobaccos, Cigars, and Cigarettes to nearly double what they were a year ago."—*Carried unanimously.*

The Honorary Secretary was asked to approach the Chief Secretary to Government and also to try to enlist the help of the British Resident in the matter.

The next subject discussed was the bad state of the main Outlet Roads.

It was proposed by Mr. H. L. Pinches and seconded by Mr. J. C. Swayne, that:—

"The attention of the Chief Engineer be called to the very bad state of the northern Outlet Road from Munnar, and particularly to the bad state of the bridge at the 5th mile, which but for the temporary repairs effected by the Manager of Nyamakad, would have been impassable for the past three months. Also that the Chief Engineer's attention be drawn to the bad state of the western Outlet Road, and that it be pointed out that, in the opinion of the Association, the repairs at present in hand are totally imadequate."—*Carried unanimously.*

The Honorary Secretary was asked to write to the Chief Engineer.

The Case of Suppan Kangany, who was convicted and imprisoned for rioting on Madupatty Estate recently, was then discussed. The Association regretted that the sentence passed on him by the District Magistrate had

been reduced on appeal. It was unanimously decided to ask any one thinking of employing this man to write to W. A. Lee, Esq., of Madupatty, before doing so.

At this point Mr. Abbott was obliged to leave the Meeting, and Mr. H. L. Pinches was voted to the Chair.

The question of the Labour Rules referring to inter-estate bolting coolies, was then discussed. It was felt something more should be done to check this.

It was proposed by Mr. C. Fraser and seconded by Mr. A. J. Imray, that :—

> " With a view to checking the bolting of coolies from Estate to Estate in the High Range, every Kangany in whose gang a bolter is found be fined Rs.5."

Mr. Pinches proposed as an amendment that the words " Unless he reports the arrival of the coolie or coolies to the Manager," be added. This was seconded by Mr. A. J. Wright. After some further discussion the amended proposal was put and carried by 9 votes to 2.

The question of the Post Office at Munnar was then brought up. The Association felt there was room for a very marked improvement in its working and that very serious annoyance, delay, loss, and interruption of business resulted from the present careless way in which the Office discharged its duties generally.

It was proposed by Mr. Hughes and seconded by Mr. M. C. Koechlin, that :—

> " In view of the serious annoyance, loss of time, and dislocation of business due to the careless and unsatisfactory working of the Munnar Post Office, and to the loss and wrong delivery of letters passing through it, the matter be brought to the notice of the S.P.O. Madura, and that he be requested to take such steps as may be necessary to ensure more careful and satisfactory work being done."—*Carried nem. con.*

The Secretary was asked to write to S. P. O., Madura.

The Secretary then stated that the last assessment for the Bodi Mettu Ghât Road had been paid, and that Mr. Fraser hoped to have the work finished and the road in throughly good order very shortly.—*Recorded with satisfaction.*

Papers on the Table—

Proceedings of Indian Tea Association.

Indian Tea Association Circular No. 46.

Indian Tea Cess Committee Circular No. 6. T. 4.

U. P. A. Circulars, 58 and 59 of 1910.

U. P. A. Circulars Nos. 1, 2, 3, 4, 5, and 6 of 1911.

Copy of the conditions for the International Rubber Exhibition Exhibits, &c.

A vote of thanks to the Chair terminated the business of the Meeting.

(Signed) ERNEST A. HUGHES,
Honorary Secretary, K. D. P. A.

Letchmi Estate, 18*th January*, 1911.

PLANTERS' ASSOCIATION OF CEYLON.

Annual Meeting.

The annual meeting of the Planters' Association of Ceylon was held at Kandy on February 10.

The Hon. Mr. Edward Rosling presided, and there was a large attendance of members.

The Chairman's Review.

The Chairman, warmly received, said: In accordance with the usual procedure, I propose, with your permission, to take the report as read, but before moving its adoption I would like briefly to refer to one or two of the more important subjects which have interested our Association during the year under review. I would like first to draw your attention to an omission in the report itself, and, that is, that the estimates of rubber shipments for the coming year—1911—are placed at five million lbs., as against three and a half million lbs. in 1910. I would also like to refer with regret to the illness of Mr. Wardrop, who had to leave suddenly for home under doctor's orders. I am glad to be able to inform the Association that the latest accounts state that he is very much better, and that he has already sailed to resume his duties. (Applause). I must first congratulate the Association on the position of our staple products. It is true that tea has shown a falling-off in quantity, but, on the other hand, the average level of prices is higher now than has ruled for many years, and the immediate prospects of this branch of the planting industry were hardly, if ever, brighter. Rubber is now assuming a position of importance as regards quantity, and although prices have fallen, they still remain at a highly remunerative level. In connection with this product, I would like to say that a chemist was appointed under the auspices of the Planters' Association and the Chamber of Commerce; that various samples have been prepared by different methods; and that these samples have been sent home to the care of Professor Dunstan, of the Imperial Institute. (Hear, hear.) The experiments will be made principally bearing on their vulcanizing properties. The thank of the Association are due to Professor Dunstan for the very keen interest he has manifested in this work. Cocoa has not shown that bumper crop that it did during the previous year, and throughout the year prices have ruled on a lower level, but the season ends showing a marked improvement. Coconuts and cardamoms are satisfactory as regards crops and as regards prices, and as a result of our advertising campaign, in connection with the latter product, a great deal more interest has been displayed in it, more especially in the United States of America. (Hear, hear.) It was only natural that the rubber boom should have been, to a certain extent, reflected here, but I think the colony is to be congratulated on the fact that the excitement, such as it was, was kept within bounds, and that we saw no such fiasco as was witnessed at Shanghai. (Hear, hear.) Finally, gentlemen, so far as our planting position is çoncerned, it was hardly, if ever, on a more prosperous footing, either financially or agriculturally. But there is a reverse side to be considered. When Mr. Chamberlain assumed control of the Colonial Office in 1895 he stated that the colonies would be cosidered as undeveloped investments of the Empire, and that it was the duty of the Colonial Office to assist in their development. In a country like Ceylon active development must depend upon European capital and European energy—in other words the merchant and the planter. I had a diagram prepared which I think will interest members. It shows at a glance what the actual effect of British capital and British energy has been in this Colony. Along the lower line you will see that the level of exports and revenue is more or less constant. At the beginning of

the coffee industry you see the curve beginning to mount upwards. The degree of that curve becomes modified during the coffee crisis, but in the tea and rubber era—from 1880 to the present day—you see a perpendicular curve, to use an Irishism, which has brought our exports up to 14 odd million sterling. That is the direct result of European energy and capital. (Applause). . . .

The Thirty Committee have not been able to do much with the small amount of funds at their disposal, but they have kept the continental campaign alive, and I think the policy is that we should keep it alive so long as we have sufficient funds to do so. The Benevolent Fund, as a result of sympathetic and generous support of friends, both at home and in Ceylon, now stands with a capital sum of Rs.2,00,000. (Applause). The expenditure approximately last year amounted to Rs.17,000, and I am glad to state that that was met by subscription and interest either paid or accrued, so that donations were entirely available to swell the capital figure. It is a great pleasure to me in addressing you for the last time from this chair to feel that this fund is now on such a footing that it can afford effective aid to those in want or in distress. (Hear, hear.) I cannot close this short review without referring to the all-important question of labour. You will hear more about it later on in connection with the Coast Agency, but, as a whole, the past year has been satisfactory for recruiting. We had 112,000 coolies come in from South India. Bearing closely on this is the Proprietors' Federation, and this is really what I want to come to. The Proprietors' Federation has been a good deal misunderstood in certain quarters, and, to put it briefly, I should like to explain that it is really a mutual association among certain proprietors not to employ their neighbours' coolies without paying their advances, and only then when the advances are not higher than Rs.45. There has been a good deal of nonsense talked and written about the liberty of the cooly. So long as that clause remains in the Ordinance, by which a cooly gives a month's notice, there can be no question of affecting his liberty. (Hear, hear.) At the present moment nearly 50 per cent. of the cultivated acreage is federated and one of the strongest arguments—an unconscious one—is that three of the most important recruiting districts, the districts which bring in the most coolies—Kalutara, Kelani Valley, and Ratnapura are the three strongest supporters of the Federation—(applause)—showing unconsciously that they realise that the Federation is there to protect their imported labour. Putting aside the question of the man who will not federate because he has always been in the habit of living on his neighbour's labour, and always intends to do so, we have now a safeguard for the labour which we imported ourselves, and that, I think, is the strongest point in favour of the Federation. I would like to express my heartiest thanks to Mr. Beachcroft for the enormous amount of help and assistance he has given, and to the Acting Planting Member in connection with planting matters generally and more particularly labour matters. I now move the adoption of the report and accounts. (Loud applause.)

The Report Adopted.

The report and accounts were adopted, and the Hon. Mr. Rosling (rising) said : I now bid you farewell, gentlemen.

[Extracts from the report were published in last week's issue, pp. 77-79.]

The New Chairman.

Mr. Bliss was elected unanimously, and took the chair amid loud applause.

The Planters' Chronicle.

RECOGNISED AS THE OFFICIAL ORGAN OF THE U. P. A. S. I., INCORPORATED.

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THE U. P. A. S. I.

(INCORPORATED.)

Bonus on Green Tea.

Mr. A. D. Jackson, who kindly represented this Association at the meeting of the Indian Tea Cess Committee at Calcutta on the 17th instant, reports that he supported the proposal to revive the bonus on Green Teas, that the matter was discussed at some length, but that when the proposition was submitted to the vote he found himself in a minority of one. Mr. Jackson states that the opposition is apparently based on two grounds; firstly, that it is considered that the prospect for a Green Tea Campaign in the United States under the new conditions is sufficiently encouraging in itself, and, secondly, that there is at present produced in Northern India some 4 million lbs. of Green Tea which command a satisfactory market. The revival of the Green Tea bonus would therefore be immediately payable on these 4 million lbs. at present produced, besides what might be produced in Southern India, and the Committee generally are of opinion that such bonus is not justifiable.

"The Planters' Chronicle."

Vol. V/2 (July 16 to December 31, 1910) is now in the press for binding, with a comprehensive index for the whole year 1910 (including both Vol. V/1. and Vol. V/2). The book is expected to be ready within a fortnight, and orders should be kindly registered early, as the supply is limited.

Plantation Rubber.

Messrs. Lewis & Peat, brokers, of London, have kindly sent the Editor a few of their revised "Hints to Rubber Planters," which give valuable "details for planters" regarding the shape and form in which Rubber should be prepared; methods of preparation, coagulation, &c.; grading and sorting; packing and weighing, marking, &c.; and sales. There can be little doubt that this publication will, as Messrs. Lewis & Peat hope, "be useful to Planters and help to promote the best interests of the Industry generally," and that they "will be of service to Planters in Southern India."

The firm state on it that they will be pleased "to value samples for Planters or answer questions with regard to Plantation Rubber when desired."

A few copies of the "hints" —which are obviously intended to be hung on office or factory walls—have been sent to this office. Any planter who wishes to have one has only to ask and receive—until the small supply is exhausted. Requests will be dealt with strictly in order of rotation; and, if necessary, a further stock will be asked for from London.

Scientific Officer's Papers.

LVI.—Pink Disease of Para Rubber and Bordeaux Mixture.

In Scientific Officer's Paper No. XXIX (*P. C.*, Vol. V, p. 210) the Experiments conducted in Cochin with Bordeaux Mixture as a preventative of Pink Disease of Pará Rubber were described, and in my Report on my second tour in Cochin I intimated that these experiments had been highly successful (*P. C.*, Vol. V, p. 501.) The experiments are now finished, and the results can be published. They were conducted on two separate estates, Palapilly, and the Cochin Rubber Co.'s estate at Vellanikara.

On the former 160,000 trees were treated; 300 acres of 4 to 5 years old trees had three applications of Bordeaux Mixture, 300 acres of 3 to 4 year old trees had two applications, and 500 acres of 2 to 3 year old trees had one application; on the latter 60,000 trees were treated and had two applications.

In both cases the same mixture was applied, *viz.*, 6 lbs. of Copper Sulphate and 4 lbs. of freshly slaked lime in 45 gallons of water. With this quantity, at Palapilly, eight buckets of 'Kola mavoo' paste were mixed to make it stick (See *P. C.*, Vol. V, p. 209.) On the Cochin Rubber Co. treacle made from jaggery was added. A more effective mixture to make the Bordeaux adhere to the trees in the wet weather is probably that recommended by Dr. Coleman, and made as follows:—2 lbs. of Resin are mixed with 1 lb. of washing soda and dissolved in 1 gallon of water and heated for about an hour until the whole mass becomes quite clear. One gallon of this mixture is added to every 24 gallons of Bordeaux Mixture.

Mr. Gudgeon, the manager of Palapilly, thus describes the method of application:—"The mixture, which is in wooden buckets, or copper pans, should be well stirred and given to the coolies in small lots. Cut bamboos are the best, as they are handy for the coolies to carry about, and the copper sulphate does not eat them away. The cooly then climbs the trees, painting all round the forks and stirring the mixture well before putting it on."

Mr. de Roos Norman, the manager of Vellanikara, applies the mixture thus:—"The stem of the tree is well rubbed with old sacking and all joints near the whorl of branches are well cleaned out of dead pieces of bark, &c. The Bordeaux Mixture is then applied all over the stem with a brush, and the mixture should be well rubbed into the fork of the tree and round the whorls of branches as high as a man can reach standing on a six-foot ladder."

The best time for applying the mixture is in May and June. The spores of the fungus are carried by the wind in the dry weather and find a lodgement on the trees, especially in the forks. At the beginning of the monsoon they germinate and penetrate the bark. The object of the treatment is to ensure that the spores germinate in a medium of Bordeaux mixture which immediately kills them, hence the treatment must be done in the dry months just preceding the break of the monsoon. A second application is probably unnecessary, but, should it be considered advisable, it should be given during the break of the monsoon in September and October.

The cost of the treatment is small. At Palapilly it was estimated at Re.1 per acre, and at the Cochin Rubber Co., the items of expenditure were carefully worked out and gave a total cost of 0·66 pie per tree. This is on

flat land ; on hilly estates the cost will be more, but it may safely be put down at less than Rs.2 per acre.

The results were most satisfactory. Mr. Norman reports that out of the 60,000 trees treated, "339 were attacked by Pink Disease, equivalent to 0·56%, or a little under one tree per acre. On the untreated area, which on this estate acted as a control plot, out of a total of 30,000 trees 400 were attacked, equivalent to 1·34%, or two trees per acre."

Much better results were obtained at Palapilly, where Mr. Gudgeon reports as follows:—"In the 300 acres block which had three applications of Bordeaux mixture there were only 30 trees (equal to about 0·07%) attacked during the year as against many times that number the year before. In the 300 acres block which had two applications, about one tree to the acre was attacked (equal to 0·7%), and in the 500 acres block which had only one application the result was very much the same, except here and there in out of the way places, where it was pretty bad, and it is probable that the coolies never painted the trees."

I attribute the difference in the results on the two estates to the fact that at Palapilly all the trees on the estate were treated, while at Vellanikara the treated trees were probably infected by spores from the untreated area late in the year.

The results on the whole may be considered most encouraging, and I think that we are justified in thinking that a cheap preventive remedy for Pink Disease, which has done such damage in the past, has been found. This is undoubtedly the commonest and the worst disease of Pará Rubber in Southern India, and it is to be hoped that in the future all estates will adopt the Bordeaux mixture remedy, so as to reduce the disease and the number of spores which may infect neighbouring estates as much as possible. The disease will never be eradicated, since it exists in the jungle on forest trees, hence the treatment must be an annual one. Of cultivated trees, in addition to the Rubber, I have noticed Pink Disease during the year on Mango, Camphor, and Jâk.

Discussing the results of the Palapilly experiment, Mr. Gudgeon writes as follows:—"There was a very pronounced difference where the trees were painted and where they were not, and I estimate that the disease was 75% less where the trees were painted. *I believe that if every tree was done properly there would be no cases of Pink Disease*, and in the majority of cases where the disease appeared in the treated area it was on long thin trees which were never painted with a brush, as the coolies could not climb up, but they were treated by tying a bit of rag on a long stick, dipping it in Bordeaux mixture, and then rubbing it on the tree, and this was not satisfactory."

In a further letter on the subject he says, "The one and only point is that *the work must be well done.* It makes it no more expensive, but only requires the special attention of the Superintendent. The very fact that some of the trees painted last July still have the Bordeaux mixture on them, though they have been through two monsoons, shows that it is only a matter of care."

A few points remain to be cleared up, and this year the following experiments will be carried out at Palapilly—

1. Trees painted only once, in May or June.
2. Trees painted only once, in September or October.
3. Trees painted twice, in May or June, and again in September or October.

The object of this series of experiments is to determine whether one application only is sufficient, and if so, the best time of year to make it.

4. A mixture with 'Kola mavoo' added to it applied once only, in May or June.

5. A mixture with Resin and Soda added to it applied once only, in May or June.

The object of this series is to ascertain which mixture resists the monsoon the better.

My hearty thanks, and those of all Rubber planters, are due to Mr. Gudgeon and Mr. Norman, and the Directors of the estates of which they are respectively managers, for the trouble they have taken, and the able way in which they have carried out all the experiments which I suggested, and for the publicity which they have given to the valuable results which they have obtained.

The following references to information bearing upon this subject, already published in the *Planters' Chronicle*, may prove of value—

Pink Disease (*Corticium javanicum*).

Description of the fungus ...	Vol. V, pp. 174 and 290.
on Crotalaria	Vol. IV, p. 338.
Bordeaux mixture treatment ...	Vol. V, pp. 210 and 250.
Bordeaux mixture	Vol. V, pp. 81, 229, and 236.

With reference to the above, the following instructions for making Bordeaux Mixture, extracted from Farmer's Bulletin No. 243 of the U. S. Department of Agriculture, may prove useful.

"Where only a small quantity is required, two half-barrel tubs are made by sawing a barrel through the middle. One tub is used for the Copper Sulphate solution and the other for the milk of lime, and each tub should contain 23 to 25 gallons. One man dips up the copper solution with a bucket and pours it into a barrel, or other vessel, and another man simultaneously dips up and pours in a bucketful of milk of lime, the latter solution being kept well stirred."

"In large operations stock solutions should always be used, as the time required to dissolve the material is saved.

"Stock solutions.—These can be prepared of both the copper sulphate and the lime. They may be made by dissolving copper sulphate in water at the rate of 1 pound per gallon, and lime in the same ratio, although a strength twice as great may be used in warm weather. When stock solutions are on hand it is only necessary to measure off the required quantity of each and dilute with water before mixing. In preparing a stock solution of copper sulphate, a 50 gallon barrel may be filled about two-thirds or three-fourths full of water, when a sack, or a box with perforations over which copper wire has been tacked, containing 50 lbs. of blue-stone, should be suspended in the upper part of the barrel and enough water added to fill the barrel. In from twenty-four to thirty-six hours this material will entirely be in solution, and the sack or box may be removed. A slight stirring will insure the even distribution of the blue-stone, after which the solution is ready for use.

"The copper sulphate should be measured in a copper or graniteware receptacle, iron or tin vessels being quickly destroyed by either copper sulphate or Bordeaux Mixture.

"USE OF AN ELEVATED PLATFORM.—If possible the dilution tanks should be raised so high on an elevated platform that the mixture can be conducted by gravity directly into the spray tank beneath. If a hillside is available, it is much the most convenient place to do the work. The platform can be arranged with a roadway on its upper side so that the lime and blue-stone can be delivered there, while the spray tank is being filled from the lower side.

"THE WATER SUPPLY.—A water supply of some sort is necessary; a tank filled by a windmill pump and elevated so as to be a few feet above the dilution tanks, or an iron pipe with a spigot may be placed over each tank. Each dilution tank should hold half the quantity it is desired to make up at one time—that is, if a 200-gallon spray tank is to be filled, the dilution tanks must hold about 100 gallons each. There is no objection to adding a few extra gallons of water, but it is better to have the tanks hold just the right quantity.

"METHODS OF MIXING THE SOLUTIONS.—Either of two methods of mixing can be employed: one in which the spray material is conducted directly from the dilution tanks into the spray tank and actually mixed in this tank; the other in which a mixing tank sits just below the dilution tanks and from which the spray, after being mixed up, is conducted by gravity into the spray tank. In certain ways the latter is more convenient than mixing directly into the tank, but unless the operations are somewhat extensive it will hardly justify the extra expense. In very large operations, however, a separate mixing tank is recommended—or perhaps even two of them side by side—so that batches of the mixture can be kept on hand for a few moments awaiting the spray wagons."

"TESTING BORDEAUX MIXTURE.—When Bordeaux Mixture is properly prepared it is of a brilliant sky-blue colour. If the lime is air-slaked or otherwise inferior in quality, resulting in a bad mixture, the preparation will have a greenish cast, and if this is very pronounced, the mixture will injure the foliage.

In order to make certain that the copper sulphate is properly neutralized by the lime, the yellow prussiate of potash test may be used. A small bottle containing a 10 per cent. solution of yellow prussiate of potash can be secured from a druggist. After stirring the Bordeaux Mixture, a drop of this solution is allowed to fall on the surface of the preparation. If free copper is present, the drop will immediately turn reddish-brown in colour. Lime should then be added until the brown colour fails to appear. If the reaction is complete, the yellow prussiate of potash solution will remain a clear yellow until it disappears in the mixture."

A rough test consists in immersing a clean knife blade in the mixture for about a minute; if the mixture is properly made the knife blade will remain bright, but if it is not in the proper proportions a deposit of red copper is formed on the blade. In this case more milk of lime must be added until the solution passes the test.

The barrels containing these stock solutions must be protected from sun and rain. They should be covered with fairly close fitting lids made by nailing sacking round the edges of a wooden lid.

RUDOLPH D. ANSTEAD,
Planting Expert.

INDIAN TEA ASSOCIATION, CALCUTTA.

WOOD-BORING BEETLES IN TEA CHESTS.

Circular No. 6, dated Calcutta, 11th February 1911 states:—

The General Committee of the Indian Tea Association have been addressed by the Committee of the Calcutta Tea Traders' Association on the above subject, it having been brought to their notice that the Government of the Australian Commonwealth have notified Importers of tea that they are liable to a penalty of £100 for every wood-boring beetle found in the wood of tea chests imported by them, the Commonwealth Government being anxious to prevent the entry of these insects into the States.

2. The Committee of the Calcutta Tea Traders' Association submitted specimens of beetles to the Imperial Entomologist at Pusa for report. A copy of his report is subjoined for information.

3. The question of how the lodgment of boring insects in the wood of tea chests can be prevented is under investigation by Dr. G. D. Hope, the Association's Chief Scientific Officer, and his report will be communicated to members in due course.

Yours faithfully,

(Signed) H. M. HAYWOOD,

Secretary.

D. O. No. 1433, *Pusa, dated* 16*th November* 1910.

From—The Imperial Entomologist, Agricultural Research Institute.

To—The Secretary, Calcutta Tea Traders' Association.

I beg to acknowledge receipt of your letter of 9th instant with its enclosures and the box of specimens.

These specimens are found to belong to four different species of beetles, whose names are:—(i) *Heterobostrychus æqualis*, Waterh. (ii) *Sinoxylon anale*, Lesne (iii) *Læmophæus testaceus*, F. (iv) *Calandra oryzæ*, L. The third-named is generally found with No. (ii) but very little is known about its life-history and probably it does not do any damage.

The fourth beetle is the common Rice Weevil which is a general pest on stored foods, wheat, rice, etc. Other species of *Calandra* have been reared from wood but this species is not known to attack it and in this case was probably attracted by the tea itself.

There remain the two beetles Nos. (i) and (ii) which we may consider as wholly responsible for the damage to the tea chests in question. Both of these belong to the *Bostrychidæ*, a family which includes a large number of wood-boring beetles destructive to cut timbers, bamboos, etc. Not only do the beetles themselves bore into the wood, but they lay their eggs in their tunnels and their larvæ also feed on the wood.

Considering these two beetles in more detail:—

(*i*) *Heterobostrychus æqualis*, the largest of the beetles sent, has been recorded previously as damaging tea chests made of Simul (*Bombax*). It is spread throughout India from Calicut to Sind and Bhutan and occurs to the westward in Madagascar and eastwards in Burma, reaching to China (Amoy), the Philippines, and Southwards to the Aru Islands and New Caledonia. So far as our information goes, it has not hitherto been found in Australia. (*ii*) *Sinoxylon anale*, a species slightly smaller than the preceding, is well-known as a borer in dead wood of various trees and in cut

bamboos. It occurs throughout the whole of India, in Burma, Indo-China, Siam, the Philippines, and from Java throughout the Malayan Islands as far South as Northern Australia, whence specimens have been found at Port Darwin (Leyden Museum) and Adelaide River (British Museum). This species has therefore already found its way into Australia.

The question of prevention of attack by these beetles is one that presents many difficulties. The wood could probably be made distasteful to them by a thorough painting or soaking with some varnish or other protective coating, but I assume that in actual practice such a method could not be adopted, as any varnish, etc. applied to the wood of the chests would be liable to taint the tea contained in them. Bamboos soaked in water for some days before being used are found to be relatively immune from attacks of Bostrychid beetles as compared with bamboos used without being so treated. The probable explanation of this is that the water removes the nutritious elements (sugars and other soluble carbohydrates) from the bamboos. The wood intended for the chests might, therefore, if well soaked after being sawn up and before the chests are nailed together, prove less attractive to the beetles. An experiment on these lines might be made, though I doubt the possibility of the application of this on a large scale.

If the chests are not treated, no method of inspection of the tea chests either at time of packing or on despatch from Calcutta could be an absolute guarantee of their freedom from infection and, even if despatched intact from Calcutta, there could be no guarantee against their infection on the voyage.

The only method which seems feasible is to abandon the use of this soft wood for chests and use either harder woods (if any can be found free from attack) or some other substance—possibly some form of papier mâche or tin case might be used. Or it might be possible to compress the wood now used so as to make it more difficult to tunnel, though beetles which will riddle bamboos and even sheet lead are likely to bore any wood.

I regret that we cannot give you any remedy, but none is applicable at present. As long as large quantities of dead soft wood are to be found in one place (such as a factory or shipping-warehouse) so long will the beetles be attracted to it and tunnel into it. If however we can give you any further information we shall be pleased to do so.

Extract from Proceedings of a Meeting of the General Committee held at Calcutta on January 17, 1911.

Scientific Department.—Read letter No. 242-32, dated 12th January, from the Government of India, Department of Commerce and Industry, communicating the decision of Government in regard to the General Committee's application for a continuance, and an augmentation, of the Government of India grant in aid of the Association's scientific research work. It was stated that in view of the more prosperous state of the tea industry and of the fact that the Governments of Bengal and of Eastern Bengal and Assam were increasing their respective grants, the Government of India did not consider it necessary to make any addition to the amount of the grant already being made from Imperial revenues, though they agreed to continue the grant of Rs.15,000 per annum for a further period of five years from the 1st April 1911.

The Scientific Department Sub-Committee were arranging for an early meeting with the Chief Scientific Officer to consider financial and other questions in connection with the proposed extension of the operations of the Department during the ensuing five yeers.

RUBBER.

To Manufacture Rubber Sheets.

A Simple Dutch East Indies Method.

Under the title of A Very Simple Method of Preparing Rubber: Ficus Banned, Mr. Van Geuns, says the *Indische Mercuur*, writes as follows in the *Soerabaja Handelsblad*:—

To-day I had the privilege of meeting a rubber planter, Mr. Van Teyn, manager of the Gogoniti (near Wlingi) enterprise, who acquainted me with an astoundingly simple method for the preparation of Ficus and Castilloa.

When the latex of the Ficus is brought in it is washed in a vat with a cock at the lower part. About three hours after the first washing he lets the water out and lets fresh water in. After the mass has had some time to stand, he finds whether the water is clean. If it is not, a third washing is resorted to. He does not use tartaric acid.

With the latex, he makes sheets in the following way:—He takes a wooden vat with perforated bottom which is fast, instead of loose, as in the case of other vats used for the purpose. A white, closely-woven cloth is laid in the vat, and upon it the viscous latex is spread, only about 350 grammes of it for each sheet, so that it may not be too thick. Thick sheets must always be rolled out, and that is what he wishes to avoid. The mass lies three days in the tub, and it has firmed up by the third day. Then it is removed with the cloth and placed on a rack of gauze, which can be ventilated by the wind, which dries it in a day; then nothing remains to be done but to remove the sheet from the cloth. To do this the most practical method is to submerge the cloth with the rubber, which sticks fast to it, in water for a time; then let the rubber sheet come off without force, and you have obtained a product that will excite the wonderment of everyone. Mr. Van Teyn had brought among others a sheet that could be stretched about eight metres. The colour is light and no impurity can be seen in the product. There are certain peculiarities in the Van Teyn method that deserve notice. The latex is taken out of the vat wherein it is washed with a wooden spoon, and the rectangular vat in which the sheet is to be formed is placed on a rack which rises in graduations. When I asked him if he objected to the use of such specifics as Purub and coaguline (old and new), he answered that he had used them. But he did not know what had been the special effect of them. Perhaps rubber prepared with the new coaguline may be more elastic and last longer. It does not require to be insisted on that the Van Teyn method is exceedingly cheap, and is to be recommended above all in those countries where people have to look to small things. —*Straits Times.*

Rubber Prospects in Papua.

Much interest is being aroused in Papua (formerly British New Guinea) by the promise of the new rubber plantations. None of these is in full bearing, but the progress of the trees has been so remarkable that the *Hevea brasiliensis* is expected to be ready for tapping a full year sooner than in Ceylon or the Malay States. The best known of the wild rubber trees of Papua, the *Ficus rigo*, is also now being largely cultivated.

There are a number of wild rubber vines from which the natives procure rubber, said by experts to be actually superior to the best Pará. Everything, in short, seems to point to a remarkable future for Papua as a rubber producing country.

SELECTED CUTTINGS.

Fungus Notes.

The Chief Groups of Fungi.—PART V.

The Ascomycetes (continued). In the last number of the *Agricultural News* the characters of the chief subdivisions of this large group of fungi were considered, mainly from the point of view of the ascus fructifications. It remains to make a few general remarks about the other spore forms belonging to the group. These are very numerous and varied, and can only be discussed very shortly here; a more elaborate account of them will be given when considering the Fungi Imperfecti, to which many of them were at one time thought to belong. The conidial spore forms may roughly be divided into three groups. Firstly, there are those in which the spores are borne freely exposed to the air, the conidiophores arising directly from the hyphae of the vegetative mycelium, as in the mildews or moulds. Secondly, forms in which the conidiophores arise as terminal or lateral branches of hyphae, woven together to form a more or less definite fructification, as, for example, the red heads of *Sphaerostilbe coccophila* on scale insects, and the *Fusarium* stage of the cacao canker fungi. Thirdly, forms in which the conidiophores and conidia are contained in closed fructifications, often opening by a pore, known as *pycnidia*, and closely resembling the perithecia of the Pyrenomycetes. The simplest form of conidiophore in the first group is a lateral or terminal hypha producing a single spore, which is abstricted and falls off, after which another is formed. In some cases, the spores may simply stick to the sides of the conidiophore, and then a head of spores, held together by mucilage, is formed. In other cases the conidia may be produced in chains, each conidium sticking to the one immediately behind it. The conidiophores may be branched, or given off in whorls, from three to six in each whorl, from a hypha whose tip is also a conidiophore. In other cases, the end of the hypha may be swollen and covered with small knobs, or *sterigmata*, from each of which one or a chain of spores is formed. Examples of these spore forms occur, as has been already stated, among the moulds, *Penicillium* spp. which grow on jam, bread, and other decaying substances. The mildews of grapes, cotton and roses are also conidial stages of ascomycetous fungi. Spores produced in this way are intended to increase the numbers of a species; while the ascospores, which are usually produced as the food-supply becomes exhausted, are intended to carry on the species until favourable circumstances again arise, and consequently often will not germinate until they have passed through a resting period of some months. With regard to the other two forms of conidial fructification, nothing further need be said here. It only remains to be added, before concluding the description of the Ascomycetes, that some species in this group may have both the first form and one of the other two, in addition to the ascospore stage.

The Basidiomycetes.—This group of fungi may, for the purpose of this article, be divided up as follows:—

Ustilagineae.
Uredinales.
Hymenomycetes.
Gasteromycetes.

In the first two groups, the basidium is divided up into four cells by transverse septa. In the Ustilagineae, each cell of the basidium gives rise directly to numerous small sporidia. In the Uredinales, however, each cell of the basidium gives rise to a lateral sterigma, and each sterigma forms

one sporidium terminally. In the other two groups, the basidium is unicellular and forms four terminal sterigmata, from each of which a sporidium arises.

The Ustilagineae.—The members of this group are the well-known 'smut' fungi of various crops belonging to the grass family.

The Uredinales.—This group of fungi is entirely parasitic in habit, and its numbers are often extremely specialized with regard to the host plants on which they can live. The whole group has been extensively investigated and is of great interest, as will, it is hoped, appear later. One stage of the life-history forms the 'rust' disease of the leaves of many different plants. The other gives rise to the 'cluster cups,' also well-known signs of disease in many temperate countries. The actual damage done by different members of the group varies very largely. The forms best known in this part of the West Indies are: rust of cotton (*Uredo gossypii*), rust of ground nuts (*Uredo arachidis*) . . . and rust of cannas (*Uredo cannae*). In this stage, the fungi form small light or dark-brown areas under the epidermis of the leaves and green stems of the host plant. When the spores are ripe, the epidermis of the host is broken and the spores are freely exposed to the air. The 'cluster cup' stage is usually more circular, and often bounded by an irregular fringe of the whitish torn epidermis of the host plant. The colour of the spores formed in the cup, and the consequent colour of the inside of the cup, is usually brown, or reddish-brown.

These fungi produce, in all, four different types of spore, though some species may show only two types, or even only one type.

PART VI.

The Uredinales (continued). In order to present a clear account of the different stages in the life-history of these fungi, a description of a particular species, *Puccinia graminis*, the black rust of wheat and other cereal crops, will be given. The spring condition of this fungus occurs on the leaves and other parts of the barberry (*Berberis vulgaris*), and on allied species; this is the stage already referred to as the cluster-cup, or aecidium stage. It consists of minute cup-shaped structures with white, fringed margins and golden yellow centres. The yellow is due to the formation of masses of spherical golden-brown spores, which are produced in chains from the ends of hyphae arranged in parallel layers at the bottom of the cups. With this stage are associated very minute spores known as *spermagonia*, which are abstricted from the tips of long, fine hyphae produced in flask-shaped cavities or *conceptacles* on the under side of the leaves. According to one theory, these spermagonia were originally male reproductive cells, but have now lost their function. This is, however, uncertain, and very little is really known about them, beyond the fact that they have practically lost their power of germination. The ripe aecidiospores are scattered by the wind, and if they fall on the surface of a leaf of wheat or other suitable, grass plant, they germinate; the germ-tube enters the leaf through a stoma, grows rapidly and infects an area around the stoma. The mycelium then gives rise to *uredospores*, borne in a mass, which burst through the tissues of the host and form rusty brown streaks on the leaves. The uredospores are oval structures, unicellular, brown in colour, and covered with spines. They germinate almost immediately, when ripe, putting out several germ-tubes through pores arranged on the central line round the spore. These spores can infect other wheat plants, and their object is to increase the numbers of the fungus during any one season. As

the season proceeds, the rust streaks become darker in colour, owing to the formation of the third spore-stage, the *teleutospores*. These are produced from the same mycelium as the uredospores, and are at first often mixed with them, though later the pustules contain teleutospores only. These spores are more or less oval in shape, dark brown in colour and bicellular, with a marked constriction at the median wall. They have thick walls, and are intended to carry the fungus through the winter. They either fall to the ground, or remain, on the withered leaves of the grass, in the pustules in which they were originally produced. In the spring, they germinate, each cell giving rise through a single pore, to a four-celled basidium. Each cell of the basidium then produces a short sterigma, on the top of which the last spore-form, a *sporidium*, is borne. This spore is a hyaline, unicellular, frequently oval structure, much smaller than the other spore-forms ; it is carried by the wind to the leaves of the barberry, where it germinates, enters the leaf, and produces a mycelium giving rise to the cluster-cups again, thus completing the life-cycle. The necessity for different host plants on which to complete the life cycle is known as *heteroecism*. This phonomenon was first definitely demonstrated by Schooler in 1818, by infecting rye from the barberry, and was subsequently confirmed by deBary and others. It was, however, suspected and early as 1781, when a law was passed in the State of Massachusetts, compelling the destruction of all barberry plants in the neighbourhood of fields of wheat and rye.

To summarize, there are four spore-stages in the life history of most of the Uredinales : the urdespore, the teleutospore, the sporidium, and the aecidiospore. Of these, the first two occur on one host plant, as for example, wheat ; the sporidia are produced from the teleutospores lying on the ground or elsewhere, and can only infect a different host plant, as for example, barberry ; from the mycelium so formed, arise the aecidiospores, which can only infect the first host. The phenomenon of heteroecism is general among these fungi, but is not always necessary, as some species can produce all their spore-forms on the same host.

(*To be continued.*)

Since the resumption of business after the holidays, the demand for tea has been less animated, observes the *Grocer* of January 14, 1911 ; but while there is no material change in quotations, the medium grades are very irregular in price, and numerous lots of Indian tea have been withdrawn from auction, bids not being up to sellers' ideas. Right up to the Christmas holidays the demand was unusually active, and prices of the lower grades were pushed up to an extreme range—much higher than to the liking of the big blenders, who would welcome a change to lower prices, which is unlikely to be realised, at any rate for to present. That there should be some reaction in the market from its previous buoyancy is only natural, but the statistical position remains very strong. The consumption of tea last year constituted a record in this country, being $3\frac{1}{2}$ million pounds in excess of 1909. Imports last year fell off by over nine million pounds, and exports decreased by $2\frac{3}{4}$ million pounds. The total stock is six million pounds less than a year ago. Common leaf is fully 1*d* per lb. dearer than at this time last year, and is scarcely so steady as before the holidays. Buyers are more disposed to give increased attention to quality than price. . . . The question of a reduction in the duty this year is also being discussed, and it is by no means improbable that such an event will take place. Altogether, the buying and selling of tea during the next few months promises to be awkward, and doubtless due caution will be exercised.

OFFICIAL PAPERS.

Leaflet No. 1 of 1911 of the Department of Agriculture, Madras.

Instructions for sending Plants attacked by Parasitic Fungi to the Office of the Government Mycologist, Coimbatore.

1. Address the packages of specimens to the Government Mycologist, Coimbatore, officially. Then, even when he is on tour, the packages will be opened in his office and suitably preserved for his examination.

2. Specimens should never be packed damp. They should always be at least partially dried. Specimens packed damp or undried in most cases arrive covered with moulds which interfere with the examination of the parasite.

Specimens selected to illustrate all stages of growth of the fungus should always be sent. It is sometimes necessary to send two or three samples at intervals of a few weeks to illustrate the stages of the disease. Usually, however, a careful search when the disease is at its height will yield specimens showing the different degrees of attack. It is best to collect a large supply of the material in the field and to go over it carefully at leisure picking out several of the best examples of each stage of the disease. The first appearance, the full attack, and the final condition should be shown.

4. In the case of leaf parasites, the leaves should be pressed between blotting paper while still fresh in order to prevent them curling up on drying. The blotting paper should be changed each day for three or four days. When dried in this manner a large number of specimens can be packed into a small space between flat pieces of card-board and sent by post.

5. Large fungi such as those growing on trees should be dried in a similar manner for a longer period, then wrapped separately in tissue paper and packed in a box. In both cases some leaves and twigs killed by the parasite should be sent because a special enduring cöndition of the fungus often occurs only on dead parts.

6. Soft or brittle fungi may be sent in methylated spirit or in whisky in a bottle very securely sealed.

7. When the localisation of the disease is not apparent, as, for example, when the plant is dying from a wilt disease, whole plants should be sent. Small plants may be pressed whole. Larger ones such as sugarcane can be dried in the sun, wrapped in gunny sacking and sent by rail. In the case of large plants, which cannot be sent whole, an attempt should be made on the spot to select specimens of those parts of the plant likely to be diseased. When a flow of gum from the trunk is a symptom of the disease roots should always be sent.

8. When the plant attacked by a parasitic fungus is not certainly known, specimens of its leaves and flowers pressed between blotting paper should be sent for identification.

Information on the following points should be given where possible :—

(1) Locality with name of village and district.
(2) Area affected.
(3) Vernacular name of the disease.
(4) Name of the plant affected.
(5) Extent of injury.
(6) Date of first appearance.
(7) Time of year when the disease is prevalent.
(8) Previous occurrence.
(9) Conditions of climate, temperature, etc., which are said to favour or check the disease.
(10) Remedies used.
(11) Whether manuring and rotation are practised.

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(INCORPORATED.)

The Scientific Officer.

Mr. R. D. Anstead, B.A., left Bangalore on the evening of the 1st instant, to proceed on tour in the Nilgiris. He expects to return early in April, and arrangements are being made for him to visit Cochin and South Travancore during that month.

The International Rubber Exhibition.

In a letter regarding preparations in connection with this Exhibition Mr. H. P. Hodgson writes from Home that he has been much impressed with the want of knowledge on that side as to Pará being profitably grown in South India. One hears nearly every other tropical country spoken of in this connection except South India. Mr. Hodgson feels sure this is "because we always fail to advertise ourselves sufficiently."

The S. I. P. B. F.

In a letter dated 10th ultimo Messrs. T. H. Allan & Co., of London, advise payment to the Association's credit of Rs.1,797-3-4, the equivalent of £120-15, as per the following list of donations :—

	£.	s.	d.
Sanderson & Co.	10	10	0
J. C. Sanderson, Esq.	10	10	0
T. H. Allan & Co.	10	10	0
Leslie & Anderson	10	10	0
Arbuthnot, Latham & Co.	10	10	0
W. J. & H. Thompson	10	10	0
Lewis & Peat	10	10	0
Harrisons & Crosfield, Ltd.	10	10	0
The Proprietors of Hay's Wharf ...	10	10	0
Weber, Smith & Hoare (Metropolitan Wharf).	5	5	0
R. G. Hall & Co. (St. John's Wharf) ...	5	5	0
R. J. Rouse & Co., Ltd.	5	5	0
C. M. & C. Woodhonse	5	5	0
A. Pittis, Esq.	5	5	0
	120	15	0
@ 1/4⅛ Rs....1,797		3	4

This is a very useful addition to the Fund, and the thanks of the Association have been tendered to all the donors, more especially to Messrs. T. H. Allan & Co., who kindly undertook the task of collecting the money.

"The Cultivation of Hevea."

Under the above title, a Manual for the Planter by Dr. P. J. S. Cramer, Director of Agriculture in Surinam, with Forty Illustrations, translated from the Dutch by Stuart R. Cope, and A. Content, will be ready shortly.

Price in Cloth Binding Rs.5, paper covers Rs.4.

Announcing the appearance of "a work on Rubber cultivation and preparation written by a most competent botanist, who has won, in a marked degree, the confidence of East Indian planters," the publishers, for the information of readers as to the direct occasion of the writing of this book, reprint the author's preface in full. It reads as follows :—

"In accordance with a decision of the Government dated 30th November 1909, I was charged to break my journey from Java to Europe at Singapore and Colombo, in order to visit the Rubber Estates of the Malay Peninsula and Ceylon, and to investigate the methods of cultivation and preparation of this product.

"In order to carry out this investigation, the journey from Singapore to Penang was mostly made overland, and about twenty estates in the Federated Malay States and Straits Settlements were visited, and several visits were paid to the Botanical Gardens at Singapore and Kuala Lumpur.

"That this journey has been successful is firstly to be attributed to the assistance and collaboration given me in the most liberal manner by Mr. W. J. Gallagher, Director of Agriculture in the F. M. S. He accompanied me on most of my visits to the estates, showed me his experiments in the gardens at Kuala Lumpur and put figures and other information at my disposal; in a word, he spared neither trouble nor time, to make my visit to the Malay Peninsula as successful as possible. For everything which he did for me, I give Mr. Gallagher my sincerest thanks.

"In Ceylon, I stayed some days at Peradeniya, chiefly with the view of investigating the experiments on different varieties of rubber which had been undertaken in the gardens of the Experimental Station, I received the assistance of Mr. Kelway Bamber, who also arranged my visits to some estates in the neighbourhood of Kandy, Kalutara and Avisawella and supplied much information. A word of hearty thanks for his friendly collaboration is not misplaced here.

"It seemed appropriate to me that I should report everything I saw in the Malay Peninsula respecting the various cultivation as shortly and accurately as possible. Mr. Gallagher was kind enough to examine and correct my descriptions, which are based on necessarily hurried observation. No better qualified expert on this industry could be consulted, and the fact that this scientist has examined my conclusions is the best proof of the correctness of my statements.

"These pages are not intended as a study of the cultivation of Hevea in the Straits Settlements in General, but only as a manual for the planter. Long series of statistics, observations at length on problems such as green manuring and catch crops are avoided ; for the latter the special literature on the subjects should be consulted ; for the former, the handbook of Herbert Wright."

Orders for the book may be registered at the office of the *Planters' Chronicle.*

Scientific Officer's Papers.

LVII.—PENTATOMIDAE.

The Pentatomidae are a family of the *Hemiptera*, a large order of insects which contains many common pests. Its members have a suctorial beak which they thrust into the plant upon which they feed and suck up the juices. Many of them have a powerful and offensive odour, which is especially noticeable in *Nezara viridula*, the familiar green bug common on many plants. Lefroy, in his 'Indian Insect Life,' thus describes the life history of the group :—

" Eggs are laid in clusters on plants, or elsewhere, in the open ; these eggs are commonly of the shape of an upright cylinder, about one-tenth of an inch high, with a flat cover on the top (like a barrel). When they hatch, this cover opens, either being attached at one side or coming completely off. The young insect is flattened, the body nearly round, and is active. It feeds on the juice of plants and passes through a number of moults with the gradual development of wings, etc., till it is full grown. The tarsi usually have only two joints, the third developing at the last moult ; the odoriferous glands are in the abdomen and open on the dorsum at the apex of the third and fourth abdominal segments. The colouring of these young insects is commonly different to that of the adult and often very striking. The number of moults is usually five ; the nymphal life is commonly short, the imaginal being the long and active period to which the nymphal is subordinated. The adults are found upon plants, upon trees, among grass, under fallen leaves and in decaying vegetation. Many are diurnal, brightly coloured species which live exposed on plants, many are nocturnal, especially the dark coloured species which live in thick grass or under leaves. Many have special foodplants upon which they feed principally or wholly and to which they are specially adapted ; in a few the foodplants appear to be numerous. Whilst the majority are plant-sucking, extracting the sap of green plants, a number (*Amyoteinae*) are known to be wholy or partly predaceous on insects, sucking the fluids from their bodies. This habit is found in the nymphs as in the adults. Not a great deal has been observed on this point, but so far as observation has gone the greater number of these insects are herbivorous and only a few predaceous. In particular the food of the species found on the bark of trees, under fallen leaves, among decaying vegetation, is uncertain. A small number are almost wholly burrowing insects, living in the soil and spending their whole life there, emerging only at night. Very little is yet known of these forms, which may prove to be comparatively numerous. These insects are most abundant during the rains when vegetation is in active growth, and a number of species probably breed only at this time. As a whole, it is probably correct to say that the majority of *Pentatomids* hibernate and aestivate as adults, laying eggs in the rains ; there are one or two broods during these months and the imagines in November hide away for the winter. There are also species which breed most actively in the cold weather and hide away in the rains. A number become active and breed during the dry hot weather if food is available, and these become very numerous in irrigated crops. The conditions of hibernation and aestivation are determinated by the degree of cold and moisture in each season as well as by the abundance of food, and this varies with different tracts ; the student may, however, remember that the adult is the resting stage and that, even in hot weather, they live for long periods waiting until food is plentiful enough to admit of their producing eggs and of the young surviving.

"*Pentatomids* are, in spite of their abundance and herbivorous habits, rarely destructive to crops. The reason is that the individual bugs do not extract sufficient sap from one plant or one twig to do harm, but they move about from plant to plant, sucking here and there, and not weakening the plant. It is only when they are exceptionally abundant or when they attack specially susceptible parts (*e.g.*, developing grain heads), that they are destructive."

Many are pests upon crops like jute, maize, juar, &c., while *Antestia cruciata* is the small brightly coloured bug which sucks the Coffee berries in the Nilgiris. Recently several insects belonging to this group have been sent in for identification. From Coorg comes *Bagrada picta*, a small insect with yellow and red markings upon a black ground, which was attacking cabbage and khol-rabi in a vegetable garden. From Travancore has been received *Aspongopus brunneus*, a dull brown bug with a red abdomen under the wings which had attacked and destroyed young Dadap (*Erythrina lithosperma*). Two much larger and more brightly coloured insects belonging to this group, but more like beetles in outward appearance, have also been received. One is *Scutellaria nobilis* of a beautiful metallic green colour, scarlet underneath, and the other is *Chrysocoris stouii*, of a brilliant green with black spots. These two do no harm as far as is known.

When these insects become troublesome they should be hand picked and destroyed; the eggs and young insects are usually easy to collect at the beginning of the attack. Contact poisons can also be used, such as Kerosine emulsion, but as a rule such insecticides do not kill them, but only drive them away or make the plant distasteful to them.

The members of the group are probably largely kept in check by their natural enemies and parasites. Wasps and Mantids (Leaf and Stick insects) have been observed to eat them, and the eggs are parasitised by *Chalcidae*, a group of wasp-like *Hymenoptera*. "Other checks are their slow reproduction and the limited duration of the seasons when abundant food makes reproduction possible" (Lefroy). Their powerful and offensive odour, produced by means of special scent glands, and caused by a volatilised oil, is apparently a means of protection from these natural enemies, and it has a strong effect on many animals, and probably on predaceous insects, though, as mentioned above, Wasps and Mantids ignore it.

In this connection it may be pointed out that the *Mantidae* are beneficial insects. Occasionally specimens are sent in and accused of eating plants, but Lefroy says of them, "all are predaceous at all times of their life; the food of the full grown insect is large living insects, which are caught when they come within reach of the waiting Mantis. None are vegetarian, none are injurious, but the group comes in the class we may denominate as 'General Predators,' feeding on such insects as come to them, and not being specially adapted to special insects."

That they are mistaken as being injurious is due to the fact that they are often found on plants attacked by other insects which are in reality doing the damage. They are, however, feeding on these insects, and thus helping the planter. Mantids should not be disturbed or killed; they are friends and not enemies.

RUDOLPH D. ANSTEAD,

Planting Expert.

Notes and Comments by the Scientific Officer.

100. *Poonac infested with Weevils.*—I have received a sample of unmilled Ground-nut Poonac infested with insects which were described by the sender as "weevils." These insects reduce the poonac to a fine powder which is apt to be lost during the milling process, but they do not have much, if any, deleterious effect on the quality, as shown by the fact that this poonac proved on analysis to contain 7% of Nitrogen, the quantity usually guaranteed. Probably the attack indicates that the poonac is old. The insects in question were of two kinds, and these have been identified at Pusa. Neither are Weevils in the Entomologist's sense of the term. The most plentiful one was a small brown beetle about $\frac{1}{8}$ in. long, *Tribolium confusum.* This is a common pest of stored produce and is stated to be abundant in America. It belongs to a large family of beetles known as *Tenebrionidae*, little being known about their life history. Most of them live on the ground in deserts and dry places, and feed on dead vegetable material, being in fact scavengers. Lefroy in his 'Indian Insect Life' says that, "about 300 Indian species are recorded, of which perhaps 50 are found in the plains. The individual species are difficult to discriminate and no comprehensive work on the Indian species is in existence." He figures this particular species, as does Smith in his "Economic Entomology."

A few specimens of a bright blue beetle, somewhat larger, about 3/16 in. long, were also present. This is *Necrobia rufipes*, a member of the family *Cleridae*, which are mostly predaceous insects and feed on animal products. Lefroy figures this species and mentions it as 'a household pest.'

101. *Insecticides* :—From time to time samples of sprays and insecticides are sent out from Europe for trial, and as a rule these compounds certainly do what is claimed for them. The latest arrival is an insecticide from Messrs. Robinson Bros., Ltd., of West Bromwich. This is in three forms, a solid known as Clift's Manurial Insecticide, a liquid for the soil, a spray called Robinsons' Pine Spray. For the last it is claimed it will kill most things, and it certainly effectually killed Green Fly and Brown Bug (*Lecanium hemisphaericum*) when given a trial upon them. The solid also killed, or drove away, ants from round the roots of plants which they were infesting, and it would no doubt prove useful to check cut worms which often do damage in vegetable gardens and in Dadap nurseries. It would also probably discourage, and kill, the caterpillar of *Polytela gloriosae* which feeds upon the leaves of Amaryllis lilies and Crocuses (*Zepharanthes*) and shelters in the ground at the crown of the bulbs.

But when it comes to using such insecticides on the estate, the price of them, cheap as they may be in Europe, is prohibitive compared with the standard insecticides in use here, on account of the cost of transport, etc., which adds roughly 20% to the price.

Take the case of the insecticide mentioned above; it costs landed here about an anna a gallon when made up as a spray, and if used for Green Bug on Coffee, for instance, it is not cheaper than Nicholson's Mixture, while for Mosquito Blight on Tea it cannot compete with the soap solution recommended by Antram, which costs only about a pie per gallon, even if it had the same beneficial effect, which remains to be proved. For use in gardens, where a high cost does not so much matter, such insecticides are to be recommended, but on the estate it seems better to use the insecticides which can be made from cheap materials easily procurable, such as Kerosine emulsions, and the various soap and resin mixtures.

RUDOLPH D. ANSTEAD,
Planting Expert.

INDIAN TEA ASSOCIATION, CALCUTTA.

Extract from Proceedings of a Meeting of the General Committee held at Calcutta on February 14, 1911.

Scientific Department.—(a) *Wood-Boring Beetles in Tea Chests.*—In the proceedings of the meeting held on the 6th December, reference was made to the action of the Government of the Commonwealth of Australia in regard to the condition of tea chests. It was reported that insects had been found in the wood of chests arriving at Melbourne. By the Australian Quarantine Act a penalty of £500 can be enforced in the case of importation of any noxious insect or pest. The authorities had drawn attention to this provision of the law, and had suggested that greater care should be exercised in the selection of timber for the boxes.

The papers had been forwarded to Dr. G. D. Hope, the Association's Chief Scientific Officer, for an expression of his views on the subject. In a letter dated 28th January Dr. Hope said that, to enable him to deal with it fully, he would require to be furnished with a number of samples of tea boxes damaged by beetles. But he mentioned that the wood of tea chests is liable to be attacked by beetles at any time after it has been sawn into shooks. This is really the chief difficulty in devising preventive measures. Pending the result of further investigations, Dr. Hope emphasised two points. Firstly the importance of using only thoroughly well seasoned wood; for proper seasoning has the effect of not only drying the wood, but also of removing from it as much as possible of the soluble matter found in the cells. If these substances remain, they attract not only beetles and other pests, but bacteria and fungi also. Secondly, Dr. Hope referred to a suggestion, which had been made by Mr. Maxwell Lefroy, the Imperial Entomologist, that harder woods should be used. It is of course possible that these may be attacked by insects, but it is less likely. Dr. Hope agreed, therefore, that it would be advantageous to use harder woods, but he recognised that they are generally more expensive. In the circumstances, he was considering means whereby—without their cost being increased—the cheaper tea chest woods might be made immune to attack by beetles. There are a number of different processes for preserving wood, and some of these he proposed to examine and to report upon at a later date.

The Committee noted Dr. Hope's remarks, and directed that the papers should be recorded in the meantime.

(b) *Entomological Branch.*—The Committee noted, with regret, from correspondence before them, that Mr. C. B. Antram, the Association's Entomologist, had decided to resign his appointment, on the termination of his agreement on the 31st March 1911. To obviate a break in the continuity of the work, the Scientific Department Sub-Committee had suggested to Mr. Antram, through the Chief Scientific Officer, that he should remain in the service of the Department until his successor could be appointed. A letter, dated 5th February, from Dr. Hope had been since received, and from this it appeared that Mr. Antram was prepared to continue until the end of September, when he proposed to leave for England. In the meantime Dr. Hope was making enquiries in England, with a view to the selection of a trained Entomologist to succeed Mr. Antram.

The Committee noted Mr. Antram's decision, and agreed to defer further action, pending the result of Dr. Hope's enquiries.

RUBBER.

Progress in Plantation Matters during 1910.

In the course of a review of the important events during 1910, the *India-Rubber Journal* remarks :—

Removing Timber.—Credit must be given to the Government Agricultural Department, Kuala Lumpur, for the change which has come over planting methods in the East in relation to the disposal of timber on new clearings. Now we find that it pays on many properties to go to a very large expense in uprooting the stumps of trees and removing partly burnt timber. This course has resulted in a diminution of pests, especially white ants and Fomes. Estates near towns are able to dispose of the timber on new clearings without much cost, but on other estates it is necessary to hire elephants and use estate labour to clear these off the areas about to be planted. In some parts of Sumatra, where the estates are low lying and subject to floods, it is reported that considerable damage has been done by loose timber. On clearings two years old the floods have carried the loose timber through the estates, and finally accumulated it against and destroyed many of the Pará rubber trees. . . .

Tapping Systems.—It is with pleasure that one learns of the advice given by the Director of Agriculture in Malay on the subject of tapping. The danger of repeatedly stripping the cortex, or bark, from Hevea trees cannot be over-estimated. Tissues are removed at a time when they contain large quantities of reserve food ; renewed bark has to be formed at the expense of reserve material, and a weakening effect is therefore bound to manifest itself after repeated excision of the bark, if this is done too rapidly. The quarter section system of tapping in order that the renewed bark may have an interval of four years before being tapped, advocated and practised by us since 1908, is the one which is gaining favour throughout Malay. This, of course, is modified in the first year of tapping by placing a V or Y incision on one side or on two opposite sides of the tree. The frequency of tapping, the distance of the tapping lines, and the number of cuts per inch of bark have received careful attention by planters. Alternate day tapping is to be recommended, providing the bark shavings do not exceed 1/20 of an inch in thickness, and the tapping lines are arranged at such a distance, and in such number, as to permit of four years for bark renewal.

A New Method of Coagulation.

Mr. Carlos Schweickhardt writes to the same journal from San Juan Bautista, Mexico, mentioning that Mr. H. Hardy, of New York, who is co-interested with him in the Mexico Latex Company, may shortly be over in Europe.

Mr. Hardy is at present investigating a process for the coagulation of rubber by the means of which it is hoped the local article may eventually be standardised, and therefore command a regular and better price in the markets of the world.

The process, devised by Mr. W. F. Dern, chemist to the company, consists of two stages, the first being the preservation of the latex. For this purpose the latex is filtered the first day it is collected, whereby particles of bark and other impurities are removed. A preserving powder, discovered by Dern, is then well mixed in, and this sets up a kind of fermentation. When this fermentation has subsided. the latex is prepared for transport by being enclosed in hermetically sealed drums. The latex prepared in this way will remain in its natural state for months. At the works it first undergoes another treatment with a second compound discovered by Dern,

two litres of this being sufficient for five gallons of latex. The mixture is then treated in a centrifugal machine, this process taking from 20 to 30 minutes. By these means the objectionable resins and protein substance are separated, and there remains, according to statements of the company, a pure, well-preserved, nervy, non-sticky raw product. The yield naturally varies according to the nature of the latex. With Castilloa latex about 35 per cent. of pure rubber is obtained, and 10 per cent. of rubber resins, with *Hevea brasiliensis* up to 40 per cent. of pure rubber and 6 per cent. of rubber resins. The value of the rubber resins amounts to about 53 per cent. of that of the pure rubber, and when working with large quantities of latex it covers the total cost of treatment.

The rubber thus obtained is immediately passed through the washing rollers and dried, and is ready for despatch within 24 hours; the rubber resins are obtained two days later. With plant as at present used in San Juan Bautista, namely, one motor, two presses, and 20 mixing machines, about 200 gallons of latex can be treated daily. The compound used to bring about coagulation can be used repeatedly, and when it finally is too weak, its original strength can be restored by distillation and the addition of about 20 per cent. of spirit. At present the rubber produced by this process is shipped to Hamburg, where it is said to find a ready sale at a good price; rubber resin is sold in the United States. Up to now the process has only been tested with Hevea, Castilloa and Balata. It should, however, be applicable to other sorts with equal results. As for the product of the new method, reports must be awaited.

In Angola.

A consular report states :—

Rubber.—From the district of Loanda there has been exported, during the last twelve months, for the first time, about 1 ton of plantation rubber. This is the product of the common Ceará species introduced in Angola some 18 years ago. The Pará and Panama rubber trees planted during recent years are making satisfactory progress.

The *Manicoba jequie* have been cut for the first time in March last. The trees then were two years old, full of fruit and yielded an average of 35 grammes per tree. By many growers this species is considered inferior to the *Ceará Maniçoba*, which grows like weeds in the coffee belt, and is actually preferred to the *Hevea brasiliensis*, which requires double the time to develop.

Owing to the introduction on the market of a new knife for extracting the milk from the *Manihot glaziovii* (Ceará rubber), the planters have recently become enthusiastic. This knife is considered to be the most practical and effective instrument for the tapping of *Maniçobas*.

The percentage of scrap rubber is greatly diminished, as the milk is diluted on the trunk with a simple alkaline solution which prevents the rapid coagulation, and permits the preparation of rubber in the form of transparent sheets, having a high market value.

All the rubber cultivators are comparatively poor Europeans with little capital. There are few planters who established new plantations of exclusively *Ceará Maniçoba*. A British Syndicate has been formed to plant rubber in the interior of Benguella, and has sent out machinery there for the further cleaning and refining of rubber which they intend to buy up from others in the neighbourhood.

The indigenous rubber plants (root rubber) continue to supply the bulk of this product from the various parts of Angola.

SELECTED CUTTINGS.

Fungus Notes.

The Chief Groups of Fungi.—PART VI.
[*Concluded.*]

The two remaining groups of the Basidiomycetes—the Hymenomycetes and the Gasteromycetes—possess one character in common besides the undivided basidia, for in both the basidia are closely packed together, side by side, to form a definite layer known as the *hymenium*. The difference between the two groups lies in the fact that, in the Hymenomycetes, the hymenium is exposed from the first, while in the Gasteromycetes it is enclosed until maturity.

The Hymenomycetes.—This group may be devided into four sub-divisions:—

Agaricaceae.
Polyporaceae.
Hydnaceae.
Thelephoraceae.

In the Agaricaceae, the fructification is of the type usually known as a toadstool. On the under surface of the umbrella-like expansion are long radiating gills, over the surface of which is the hymenium. The fructifications may or may not be stalked, and the stalk may be central or lateral, but the gills are a constant feature. To this group belong *Marasmius sacchari*, the fungus causing root disease of sugar-cane; *Marasmius semiustus*, causing disease of bananas; *Schizophyllum commune*, which sometimes attacks cane stems; and all the numerous saprophytic toadstools.

In the Polyporaceae, the hymenium lines the cavities of long or short densely packed tubes or shallow depressions occurring in a sporophore that frequently projects from trees, like a bracket. Several of the genera, especially *Polyporus*, are wound parasites on different trees. The sporophores may sometimes live for as long as fifty years.

In the Hydnaceae, the fructification again projects at right angles to the tree bearing it, and produces from its under side numerous acute spines, or warts, or folds, on which the hymenium is borne. Some members of the genus *Hydnum* are parasitic on trees.

In the Thelephoraceae, the hymenium is smooth and superficial, and the sporophore may have a central stalk, or may life flat on the subtratum. To this group belongs the fungus causing pink disease of cacao (*Corticium lilaco-fuscum*). Most of its members are saprophytes.

The members of the Hymenomycetes, in general, contain comparatively few species recognised as parasites, the majority being saprophytes on decaying wood, or other vegetable remains.

The Gasteromycetes.—This group contains very few parasitic forms, though numerous saprophytes of beautiful colouring and shape belong to it.

Two families may be shortly mentioned:—

Phalloidaceae.
Lycoperdaceae.

In the Phalloidaceae, the hymenium is borne on a receptacle that frequently takes the form of a fine net-work, or a wrinkled swollen terminal portion hung on a central stalk; the stalk and receptacle are at first enclosed in a definite skin, and the fructification is spherical. Later, however, the skin is broken by the elongation of the stalk, and the net-work, when present, hangs free at its summit. It is covered usually with drops of strongly smelling mucilage in which the spores are contained. The mucilage

attracts flies, which assist in the dispersal of the spores. One species, *Phallus gracilis*, also known as *Ithyphallus coralloides*, and another *Clathrus trilobatus*, are responsible for root diseases of sugar-cane in Hawaii.

To the family Lycoperdaceae belong the puff balls, which are closed, more or less spherical, white or yellowish fructifications, dehiscing by a terminal pore when ripe, and setting free a mass of dusty spores. In some cases, there is a long central stalk, as in the Phallaceae, surmonnted by a cap bearing the spores, the whole being enclosed within a definite skin until these are ripe.

PART VII.

The Fungi Imperfecti.—This is the last group of fungi to be considered. It contains many genera and species that vary immensely in form, but which are all characterized by the possession of conidia only, and by not forming any higher fructification, such as an ascospore. Most of them are species whose life-history has not been completely worked out, though they are suspected of being stages in that of various fungi belonging to known or unknown species of the Ascomycetes. Of late years, many of them have been more fully investigated, and in consequence have been removed and placed in different groups of the Ascomycetes. The group may be sub-divided as follows :—

Sphaeropsidales.
Melanconiales.
Hyphomycetales.

The Sphaeropsidales.—These fungi produce conidia borne at the tips of slender conidiophores. The conidiophores, and frequently paraphyses, are contained in pycnidia, which often closely resemble the perithecia of the Pyrenomycetes. Two of the families in this cohort may be shortly considered.

In the Sphaerioidaceae, the pycnidia are always black in colour, and of the consistency of leather or charcoal. They may be free and superficial on the substratum, immersed in it, or grouped on a stroma. The conidia may be unicellular or multicellular, hyaline or dark brown. The minor characters, such as the presence or absence of a stroma, and the colour of the spores, serve to divide the different genera from one another. To this family belong the species Diplodia cacaoicola, causing die back and brown pod of cacao. *Botryodiplodia* sp., causing root disease of cocoanuts, and one or two other allied species of economic importance in these islands.

In the Nectrioidaceae, the pycnidia are fleshy in consistency, and frequently brightly coloured, never black; they may be free and superficial on the substratum, or grouped in a stroma. The conidia may be uni—or multicellular, hyaline or slightly coloured. To this family belongs the genus *Aschersonia*, two species of which are parasites on the white fly in Florida.

The members of these two families probably represent stages in the life-history of different members of the Sphaeriales, and Hypocreales, respectively, in the Ascomycetes.

The Melanconiales.—In this cohort, the conidia are produced on a more developed cushion or stroma, beneath the surface of the substratum. These cushions finally break through to the surface, in most cases, and form superficial pustules of spores, often coloured in the mass, as in the genus *Colletotrichum*, where they are frequently pink or yellow. The stroma is generally black, and this gives the ffructifications a black appearance when young. In the case of *Colletotrichum falcatum* they remain black. In other cases, the spores are extruded in a tendril and are dark brown, or

black in the mass, as in the genus *Melanconium*. The cohort contains only one family—the Melanconiaceae, but this embraces several important economic genera. It contains, for instance, the anthracnose fungi of the genera *Colletotrichum* and *Gloeosprium*. *Colletotrichumgossypii* causes anthracnose of cotton, *C. luxificum*, witches' broom of cacao, and in addition several other species occur on cacao pods. *C. falcatum* causes red rot of sugar-cane, and *Gloeosporium musarum*, anthracnose of hananas. The melanconium stage of *Trichpsphaeria sacchari*—the rind disease fungus of sugar-cane, was also at one time thought to be a separate fungus and included here. *Pestalozzia palmarum*, which attacks the leaves of cocoanut palms, is ancther member of this group.

The Hyphomycetales.—These fungi are mainly superficial, sometimes only partly so; rarely endoparasitic on insects. The hyphae are often profuse and bear free, naked conidia. These are for the most part the fungi known as mildews and moulds. The cohort embraces four families.

In the Mucedinaceae, the hyphae and conidia are hyaline, or clear-coloured; never brown or blackish. The family is sub-divided on the characters of the conidiophores and the shape of the spores; whether they are borne singly, in chains, or in heads; if they are one or more-celled; and similar characters. *Ramularia areola*, causing areolate mildew of cotton, is included in this family, as well as different genera causing mildews of grapes, roses and many other plants. Many of them have been shown to be stages in the life-history of different species of the Ascomycetes.

In the Dematiaceae, the hyphae, or conidia, or both, are brown or blackish. The genera are separated by characters similar to those dividing the genera of the Mucedinaceae. The group includes the genus *Cladosporium*, one species of which, *C. elegans*, causes a well-known disease of the orange; and the genus *Cercospora*, of which *C. gossypina* causes leaf spot of cotton. This fungus is really a stage in the life-history of *Sphaerella gossypina*, an Ascomycete. Other species are responsible for various leaf spots on coffee, ground nuts, and sugar-cane. The pine-apple disease fungus of sugar-cane, *Thielaviopsis ethaceticus*, is also a member of this family.

In the Stilbaceae, the hyphae are woven together to form a more or less erect, cylindrical stroma, from which conidiophores are produced, either terminally or all over. The conidia and one or more-celled, and, together with the stroma, are frequently coloured. To this family belongs the genus *Isaria*. whose species are frequently parasitic on insects; larvae, pupae and the full developed insects being attacked; many of the species are stages in the life-history of members of the ascomycetous genus *Cordyceps*. Another genus in this family is that of *Stibella*, of which *Stibella flavida* has recently been shown by Massee to be a stage in the life-history of the Ascomycete *Sphaerostilbe flavidum*. The conidial stage has long been known as causing the important coffee disease of the New World.

In the Tuberculariaceae, the hyphae and conidiophores form a conidial patch or *sporodochium*, which is usually disc-shaped or effused, and frequently coloured. The conidia may be uni-or multicellular. The genus *Fusarium* is contained in this family. Fig. 32 shows two stages in the life-history of *Fusarium lycopersici*, which causes sleeping disease of tomatoes. Many of its species are stages in the life-history of different species of Nectria and allied genera. The genus *Microcera coccophila*, is common in these islands as the usual form of the red-headed fungus of scale insects (*Sphaerostilbe coccophila*), which is closely allied to the nectrias.

These, then, are the main divisions of the fungi.

Protection from "White Ants" and other Pests.

A correspondent wrote to *Nature* in December last :—

" In a recent number of *Nature* there was a note on the subject of ants in general and white ants in particular (they are not ants, but that does not matter, as they are "so called"), in which it is said that the Admiralty has decided in favour of "blue oil." Blue oil is the residue left in the distillation of mineral oils after the isolation of kerosine (called petroleum in England) and paraffin. I therefore venture to give you my experience in regard to the same and as to some other cognate matters.

" Some twenty years ago I bought a cottage at Mittagong, about eighty miles from Sidney ; it was furnished, and when I went there for a night I heard a continual rasping sound whilst in bed, and next morning, on examining the place I found it was infested with white ants. They had eaten the pine lining in two rooms, as well as the uprights of a door.

" I was then connected with a kerosine company, and immediately got a quantity of blue oil, which I had sprinkled all round the foundation of the house with a watering can. The result is that the lining is in the same condition that it was twenty years ago. This is not an isolated instance, because during that time I have had much experience of 'white ants,' and have always found that they cannot work if they are cut off from connection with the ground, from which they get moisture, which is necessary for them, and they do not seem able to get through ground saturated with blue oil.

" There is another matter to which I may refer in this letter. When I bought my present home, in 1882, I found it full of weeds and ants. I have got rid of both by extermination, and with the latter of aphis and almost entirely of scale insects. Of the former I have not seen one for the past fourteen or fifteen years. My first experience was with black aphis, by which the leaves of a nectarine tree were all curled up, whilst ants were continually running up and down the stem. I had read Sir John Lubbock's account of ants carrying the eggs of aphis to their nests, and I therefore shaved off the rough bark and chalked the stem for a foot or so, and the result was that the ants soon ceased to visit the tree, and we had a healthy tree and a fair crop of fruit. I may say that, so far as my observation goes, ants cannot climb up a chalked stem or post, as the chalk comes off with their feet and they fall down. I am not sure that this is the correct interpretation, as I have seen that if a broad chalk line is drawn round a meat-dish standing on a shelf the ants seldom get across it, and if they do it is only by some place being missed in chalking. They seem to leave a trace of formic acid behind them which guides the followers, and, combining with the calcium of the chalk, deprives them of their clue.

" As to ants in general, I may say that after trying various ways to get rid of them I have come to an effectual method, that is, to find their nests and pour down each hole two ounces of a solution of cyanide of potassium. Two ounces per gallon is the strength I have used, but it might be weaker. The ants are not all killed by the first dose, for some of them are out foraging, and one cannot be certain of killing all the queens, but by giving them a dose once a week or a fortnight it is possible to get rid of them.

There is another matter I may mention. Some thirty-nine or forty years ago I observed an old shingle-roofed cottage at Maitland. It had two dormer windows, the sides of which had been painted white with white lead. The whole of the roof was rotten with fungoid growth except below the dormers, where the paint had been washed down by the rain, leaving a white streak and there the shingles were nearly as good as they were when put on. It was therefore evident that white lead was inimical to fungoid vegetation."

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(INCORPORATED.)

The late Mr. H. G. Parsons.

Reference should have been made last week to the death of Mr. H. G. Parsons, of Beechlands, Pollibetta, which occurred on the 25th ultimo at Bangalore.

With one notable exception, when he waxed eloquent in his representations of the need for a railway connecting Mysore and Coorg with the West Coast, Mr. Parsons had not during recent years taken a prominent part in the public discussion of "planting politics." He held strong opinions in regard to various matters, however, and in earlier years he expressed them freely at meetings of the Coorg Planters' Association and the U. P. A. S. I. Of the latter he was Vice-President during the year 1897-98, and on various occasions during a period of some 10 or 12 years he maintained close touch with the Association and helped to advance its interests. Latterly he had left practical planting to other hands and had turned his energies chiefly to the extraction from the soil of its mineral, not its plant, wealth. It says much for his versatility that he had been fairly successful in the new line he took up somewhat late in life.

A genial companion and a sterling friend, Mr. H. G. Parsons will be missed in a number of social circles, and the sympathy of many planters will assuredly be extended to the bereaved widow and children.

The International Rubber Exhibition.

H. E. the Governor of Madras in Council has been pleased to sanction the liberal grant of Rs.3,000 towards the expenses of this Association in connection with the opening of a special South Indian Stall at the International Rubber and Allied Trades Exhibition.

LABELS FOR EXHIBITS.

The Manager of the Exhibition has kindly sent a specimen of the labels for pasting on exhibits, so that something similar may be printed out here. He writes that he would have sent a supply, but did not know how many would be required, so thought it best for them to be printed in India.

If Hon. Secretaries of District Planters' Associations will kindly send early intimation of the number required, their orders can be lumped together and executed on the most favourable terms, the cost being paid out of the Exhibition Fund if the Committee approve. In any case, it is not likely to exceed one anna per label, though the labels are large.

Scientific Officer's Papers.

LVIII.—Para Rubber Seed Oil and Poonac.

At the Annual Meeting of the U. P. A. S. I. in 1910 I suggested that the seeds of Pará rubber, which are annually increasing in quantity, and are not all wanted for planting purposes, should be utilised by extracting the oil from them and using the residual poonac as a fertiliser (See *Planters' Chronicle*, Vol. V, p. 364). This is all the more important since the price of poonacs is yearly increasing.

The matter was taken up by the Malabar Coast Planters' Association, and a quantity of seed was last year sent by Mr. Kirk to Messrs. Peirce, Leslie & Co., Ltd., at Cochin, who conducted some preliminary experiments in crushing. These experiments have not been altogether successful, as there is a difficulty in extracting all the oil from the seeds with the machinery at our disposal. However, the difficulties are no doubt superable, and the results obtained indicate that the poonac is likely to prove a valuable fertiliser. Whether or not it will pay to extract the oil yet remains to be proved, but I strongly advise planters to adopt some method of extraction, since the value of the oil, even if it does not yield much profit, will lessen the cost of the poonac.

Messrs. Peirce, Leslie & Co. recently sent me samples of the oil they had extracted and the residual poonac, and I have examined these in my laboratory. A weight of 1,133 lbs. was operated upon, and this was found to consist of 772 lbs. of husk, or 68%, and 361 lbs. of kernel, or 32%. When Pará seed was reported on by the Imperial Institute in 1909, the kernels were said to constitute about 42% by weight of the whole seed. The kernels were crushed and yielded 38 lbs. of oil, or 10·5% only, and 260 lbs. of poonac, there being a loss of 63 lbs. This is a disappointing yield of oil, but when the poonac was analysed it was found to have 33% of oil still remaining in it, so that the original kernels contained about 34% of oil, and the method of extraction was at fault.

The poonac had the composition given in the first column of the following table.

	I.	II.	III.
Moisture ...	6·40	9·55	...
*Organic matter	55·12	82·27	91·50
Oil	33·00	...	...
Ash	5·48	8·18	8·50
	100·00	100·00	100·00
*Containing Nitrogen	3·49	5·29	5·74

The ash contains 15·12% of Phosphoric Acid and 12·93% of Potash.

If now we calculate from these figures the composition of the poonac when all the oil is removed we get the results given in the second column of the table, and the phosphoric acid content of the poonac works out at 1·23%, and the Potash at 1·06%, as compared with about 1·8% and 1·2% respectively, in the case of Castor poonac. When judging the value of a poonac the chief thing to be considered is its Nitrogen content; the quantities of phosphoric acid and potash are usually so small that they are not taken into account, still they are not absolutely negligible.

If the analyses given above are compared with the figures given in the third column of the table, which show the average composition of Castor

poonac, it will be seen that Pará seed poonac will be a valuable fertiliser, and it is well worth while continuing the experiment of its manufacture.

Taking Mr. Kirk's figures given in the *Planters' Chronicle*, Vol. V, p. 399, it appears as if the yield of seed will be small for the present, and the supply of the poonac limited, but both will increase year by year.

With regard to the oil, it is at present under examination. In 1909 it was reported on in the *Bulletin of the Imperial Institute* as follows:—

> "The kernels contain about 42% of oil, which when exposed to the air,' 'dries' in the course of a few days, yielding a clear transparent film. It generally resembles linseed oil in properties, and like the latter could probably be used in the manufacture of paints and varnishes, oil cloth, soft soaps, and similar products."

The oil expressed from a small sample of seed was then valued at the rate of 21 shillings per cwt.

RUDOLPH D. ANSTEAD,
Planting Expert.

The Brazilian Coffee Industry.

As regards the future, the prospects of the industry are probably better than they have ever been in the history of Brazil. The policy of the Government in restricting the further planting of coffee was not only necessary as part of the valorisation scheme, but it constitutes a departure which will have its effects for an indefinite period. The beneficent result of it is now so recognised that the regulation of the area under coffee has become part and parcel of the Government business. At the present time there appears to be a growing feeling among the planters that the time has come when the question of modifying the Government restrictions should be seriously considered. No doubt in due time this will come about.

Expansion of the Demand.

There can scarcely be a doubt that the world's demand for coffee is steadily on the increase. Not only is this the result of the natural increase in population, bnt in many important instances the coffee drinking habit is undoubtly extending. A typical example may be cited in the case of Japan. As everyone knows, large and constantly increasing numbers of Japanese come to Europe, and stay quite long enough to acquire European habits, including the imbibition of European beverages. They go back to Japan with sundry new and acquired tastes, and one of them is the habit of drinking coffee. But yesterday coffee drinking in Japan was so entirely exotic as to be practically confined to the Exropean colony. It is not so to-day, and one may foresee that in a comparatively short period the importation of coffee into Japan will become an important factor in the trade. . . .

While Brazil holds the position it does in relation to the coffee trade the Brazilian Government is practically master of the situation. As the exigencies of the market appear to require it no doubt the acreage planted will be allowed to extend, but always in proportion to that demand considered in relation to the stocks in hand. From a planter's point of view, the organisation of the industry has been brought to a point where the conditions are as nearly ideal as anything in connection with human activities can be expected to attain. For all that, fluctuations in price will, as is their wont, indulge in the anticipation of future events.—*Financier.*

Notes and Comments by the Scientific Officer.

102. *The Cambium.*—Since Rubber has been tapped the 'cambium' has become a household word, and a sacred thing not to be touched or damaged, but frequent enquiries indicate that much misunderstanding exists as to the functions of this tissue and why it must not be damaged. The text book defines the cambium as, 'a layer of tissue formed between the wood and the bark, and consisting partly of nascent wood and partly of nascent bark.' If the bark is stripped from the wood of any tree the separation takes place at the cambium, which is a thin layer of very delicate tissue. In the bark are channels, like a system of pipes, down which flows the sap carrying the food materials manufactured in the leaves, by the energy supplied by the sunlight, from the carbon dioxide obtained from the air and the plant foods like nitrogen, phosphoric acid, and potash, dissolved in water, carried up through a similar system of pipes in the wood. This supply of worked up food is distributed to all the growing parts of the tree, both roots and stem, and some is stored up for future use in the form of sugar and starch. The latex, which is also formed from this wood material, is contained in a system of cells in the bark outside the cambium, and these are quite independent of the sap-conducting tissues which occur in all trees, while latex is only found in a few special trees. If the bark is cut through all round the tree the downward flow of sap is stopped, and the supply of manufactured food cut off from the roots, and everything below the cut, resulting in starvation and ultimate death. This is why a tree dies when it is ringed. Here the special function of the cambium comes in. It is constantly growing and forming new tissues, wood on the inner side and bark on the outer, and when the bark only is removed the cambium heals up the cut, grows new bark over it, and reconnects the broken system of cells conveying the sap. and makes new latex cells. Hence the importance of not cutting and killing the cambium, and of not tapping a tree all round its circumference at the same time. Excessive tapping weakens a tree, not so much by withdrawing all the latex, probably, but by cutting off too much of the food supply from the roots.

Injury to the cambium means the cessation of growth ; new bark is not formed and the cut does not heal. If the injury involves a large portion of the cambium it is obvious that this is serious; where the injury is not extensive a renewal of growth soon takes place.

103. *Importation of Green Bug.*—I am gratified to find that Mysore is taking active precautions to avoid introducing Green Bug (*Lecanium viride*) on to the Coffee. Planters coming from infested districts to take up work in Mysore are warned by the Association of the danger, and requested to take every precaution. I have been asked if there is danger of importing the Bug on seeds of legumes obtained from the Nilgiris. The Bug is not very likely to be found on the seed, but young scales might easily be imported clinging to the packing, and if it is necessary to import seeds from infested districts, the packing in which they come should be burned as soon as possible, and the seeds should be soaked in Corrosive Sublimate, 1 part in 1,000 of water, that is, 1 oz. to 7½ gallons. The seed may then be either sown at once, or dried and stored. This treatment will have no deleterious effect whatever upon the germination.

RUDOLPH D. ANSTEAD,

Planting Expert.

DISTRICT PLANTERS' ASSOCIATIONS.

Coorg Planters' Association.

Minutes of the Quarterly Meeting of the Coorg Planters' Association, held in Mercara on February 27th, 1911.

PRESENT :—A. J. Wright, O. B. Achard, W. R. Wright, F. W. Gerrard, Hume, Shaw, Alexander, Ball, Graham, Mann, Tweedie, Garrett, Bracken, Jackson, G. K. Martin, Grant, Sheldrick, Mahon, Grove, Maclean, G. Haller, R. H. Ellis, A. J. Curgenven, Commissioner of Coorg, the Revd. G. A. A. Wright, visitor, P. G. Tipping, C. E. Murray-Aynsley, President, and R. D. Tipping, Honorary Secretary.

The Labour question was discussed at considerable length, and the advisability of increasing the wages of the better class of cooly was considered.

It was resolved that the Hon. Secretary do ascertain the recognised rates in other planting districts, and that a sub-committee of 1 member from N. Coorg, Mr. Graham, and 1 from South Coorg, Mr. Grant, together with the Hon. Secretary shall go into this matter, and lay their views before a General Meeting at an early date.

Sc. O. Scheme.—Mr. R. D. Tipping spoke as follows :—

Gentlemen,—I will not take up your time with a long speech on the question of additional assistance, which it has been proposed to secure, in order to deal with the many pests that Coffee is heir to. Mr. C. H. Browne, in his speech at a Meeting of the North Mysore Association, has eloquently urged the necessity for such aid, and I cannot do better than read to you what he says on the subject. With regard to Coorg, I know, there are some, I hope not many, who because they at present enjoy comparative immunity from pests such as Stump rot, Mealy Bug, leaf disease, etc., fail to see the necessity of doing anything so long as Coffee is paying well. To these I would say, prevention is better than cure, and we never know when the day of reckoning may come—let us be prepared.

There are others who fully realise the havoc that is being played by pests that have already established themselves. Let us, one and all, combine in a systematic campaign against these troubles. Let us acquire the necessary knowledge if possible regarding the scientific use of manures, and the growing of cover crops.

The Government have shown that they are fully alive to the necessities of agriculturists in this respect by establishing a development for Agriculture, and they are willing to assist us as far as possible ; let us show that we are also willing to assist ourselves. I shall not ask you to come to a decision or vote on this question at the present Meeting, but let me ask you, one and all, to give this very vital subject full consideration. There will be time before our next meeting for those who wish to consult their friends at home to do so, and I hope when we meet next it will be to decide in favour of securing the services of an Assistant to Mr. Anstead for North Mysore, South Mysore and Coorg.

The details for the working out the scheme may be entrusted to a small committee from each district, which can meet at some convenient centre.

I will now give you roughly the details from the financial point of view.

Cost of U. P. A. Subscription, District Association upkeep, and Sc. O. Fund.—

For Coorg—combined with N. & S. Mysore—with 1 Assistant.

Areas at present subscribing are approximately as follows :—

N. Mysore	12,640		
S. „	12,200	acres 35,840. At 6 annas per acre=	Rs. 13,440
Cooorg say	13,000		

Cost of additional Sc. O. as per details per annum ...	Rs.	7,000
Contribution to U.P.A. at 8 pies and Sc. O. Fund with Laboratory and other contingencies say 1/6 per acre ...	„	3,360
Upkeep of District Associations at 1 anna per acre say ...	„	2,250
	Rs.	12,610

This is assuming that those representing the area now subscribing will continue to do so. 8 annas per acre is a round sum, and if it were found to be more than sufficient it could be proportionately reduced after the first year. The figures for the District Associations' expenses are based on those of Coorg.

ESTIMATED COST OF A SCIENTIFIC ASSISTANT.

Salary ...	£300—25—400 average ...	Rs.5,250
Passage (out and home), appliances, peon, postages, stationery, &c.	„ ...	„ 750
Travelling Allowance	...	„ 1,000
	Rs....	7,000

Very little enthusiasm was displayed regarding this subject, and so far only a few members have promised their support. Some doubts were expressed as to the ability of one Assistant to fulfil the requirements of so large an area as N. and S. Mysore as well as Coorg.

Experimental Plots.—The Hon. Secretary drew attention to what had been undertaken, and asked members to carry out these experiments. Mr. Jackson gave some figures as to the crop he had picked from Hybrids of the 5th generation, which showed they were capable of yielding heavy crops.

Roads and Communications.—The prospectus and other papers in connection with the General Motor Transport Coy. for the Provinces of Mysore and Coorg. Mr. Ball drew attention to the bad state of Roads leading to Mysore, especially to the section between the Police Station, and Hunsur, and suggested that the attention of the Resident of Mysore might be called to the fact that this is the only outlet from Coorg to Mysore.

Sidapur-Pollibetta Road.—It was proposed that the District Fund Board be approached with a view to the opening out of the road—and section II was the one which should be commenced first if possible. Mr. Jackson, member of the District Fund Board, mentioned that our thanks were due to Mr. Curgenven, President of the Board, for placing all the correspondence in connection with this project at his disposal. A hearty vote of thanks was recorded. The proposition, with Mr. Jackson as proposer and Mr. Bracken as seconder, was passed *nem. con.*

Correspondence—Relating to various subjects, and including the proposed Cess of Coffee was laid before the Meeting.

The election of two new members of the Planting Community as Members of the District Fund Board was resolved upon, and balloting papers are to be sent out accordingly.

Prevention of Thefts of Produce.—The papers regarding this subject were read, and considered satisfactory.

The U. P. A. Exhibition.—The proposal to increase the scope of this little exhibition was brought forward, and members were asked to contribute exhibits.

General.—Mr. Ball enquired as to what steps had been taken to welcome the Chief Commissioner on his first visit to Coorg, by the Association. The Secretary explained that, though individuals had taken the opportunity of calling upon Colonel Daly, nothing had been done by the Association as a body on this occasion. Mr. Ball considered that this should have been done.

Mr. Mann drew attention to the fact that some planters sold their "goondloo" or "tails" Coffee in the husk to local traders, thereby placing temptation in the way of cartmen to dispose of good parchment Coffee, and replace it with the above inferior grade. He suggested that bad outturns at the Curing Works might in some cases be due to this cause, and asked planters not to sell their tails coffee, in the husk to local traders.

The President asked for a hearty vote of thanks to the Secretary for the satisfactory way in which the affairs of the Association had been carried on. This was heartily accorded. A vote of thanks to the Chair concluded the proceedings.

(Signed) R. D. TIPPING,
Hon. Secy., C. P. A.

A Meeting of Nilgiri Planters.

On the 6th March a number of planters assembled at the Kotagiri Club to meet Mr. R. D. Anstead, B.A., the Planting Expert, who had spent a few days touring in the district. The meeting was quite informal and took the form of a general discussion upon subjects of local interest. The most important point dealt with was Stump Rot and its effects upon Tea, which is rapidly replacing the Coffee which has been weakened or killed by Green Bug. The subject of fertilisers for Tea was also discussed and the various diseases of Tea and their remedies and also the best shade to plant.

After the meeting the local Experiment Committee met and discussed with Mr. Anstead a plan of campaign. It was decided to conduct experiments during the year with, (1) Nitrolim (2) Leguminous green dressings, (3) Pruning in relation to Pink Mite. The results of experiments carried out by Mr. W. A. Cherry at Kodanaad with properly conserved manure composed of yard and line sweepings, &c., and dealing with the effect of burying tea prunings in a green state will also be laid before the Committee when available.

RUBBER IN STRAITS AND F. M. STATES.

The Editor of the *Agricultural Bulletin* of the Straits and Federated Malay States writes:—"Through the courtesy of the land officials I have been able to obtain approximately, the area of land under cultivation in various parts of the Colony. The figures are only approximate, sent by the registration under the Rubber Dealers' Ordinance, when completed, we shall be able to get a more definite and accurate idea of the area cultivated.

The estimates are as follows:—

Singapore ...	...	14,000 acres
Malacca between	...	55,000 and 60,000 acres
Penang ...	...	3,000 acres
Province Wellesley	...	22,920 acres

The total approximates to 100,000 acres, which is a pretty large area considering the class of country in which it is planted.

RUBBER.

New Rules Governing Contracts for Plantation Rubber.

The *India-Rubber Journal* of 4th ultimo states :—

At the fortnightly Plantation Rubber Sales at the London Commerial Sale Rooms, on Tuesday, Mr. S. Figgis said they were all aware some new rules had been framed in reference to the Plantation Rubber Sales and amongst them was one dealing with the question of arbitration. The rules had been passed and the sales that day were under these new rules. He had been instructed to announce that the committee who had dealt with the matter had suggested the following names to act as arbitrators when necessary for the remainder of the year, *viz.*,—Mr. Andrew Devitt, Mr. Worthington, Mr. A. H. Prunnett, Mr. Hendrey, Mr. Bower and Mr. Howard Figgis. Those gentlemen would do what was necessary, and it would doubtless be to the satisfaction and in the interest of the trade.

Mr. Wilson (Messrs. Wilson, Smithett and Co.) pointed out that two of the arbitrators were from Mr. Figgis' firm and two from another firm. To have four arbitrators out of six from two firms seemed to him to be rather a preponderance.

Mr. S. Figgis said the names of 15 or 17 rubber brokers were submitted and voted upon, irrespective of the firms whom they represented. It was thought these gentlemen were the best to act in the interest of the trade generally.

Mr. Sutro agreed with Mr. Wilson that it seemed a preponderance, and he asked why the humble rank and file of the trade were not represented. He thought the whole scheme should be submitted to the trade.

Mr. Figgis said the scheme had been passed, and the only question was that dealing with arbitration.

Mr. Sutro—Passed by a self-appointed committee.

Mr. Figgis.—No. By the Association. Nothing had occupied his mind more during the past three months than this question, and it seemed a pity that at the last moment objection should be taken unless there was a definite suggestion to make. If they had any names to suggest, by all means let them do so.

Mr. Wilson did not think that was the time or place to discuss the matter, but as there was evidently a difference of opinion, he thought it would be better to hold a meeting.

Mr. Figgis pointed out that several meetings had been held, including two public meetings, in that room. If they had any other names to suggest let them do so, and bring the matter to a head.

Mr. Wilson did not think that was the place to do so.

Mr. Figgis ruled that that was the course to be adopted. If it was found to be wrong and bad it could be altered and put right.

Mr. Sutro them proposed Mr. Bussweiler, but this name was not seconded, and the proposition accordingly fell through.

The question then dropped. and the sales proceeded.

The following are the "Rules and Regulations Governing Contracts for Plantation Rubber" sold under the General Produce Brokers' Associa-

tion of London Rubber Rules. They bear the date 23rd January, and commence by defining "Prompt."

Prompt.—Prompt Saturday fortnight from date of sale or tender. Sales or tenders dated on Saturday to be prompt that day fortnight. Draft ½ per cent. Discount 2½ per cent. Interest at 5 per cent. per annum on all pre-payments. The goods are at the risk of sellers (to the amount of the Contract value only) until the prompt day, or delivery of the Rubber from the warehouse before that day.

Weighing.—Weighing at the option of the seller at any time between the Wednesday week preceding prompt and the Thursday before prompt day, both days inclusive.

Clause I.—In Contracts of 5 tons or over, buyers shall have the option of rejecting any tender of less than one ton, and in contracts of under 5 tons, any tender of less than ½ ton, except in each case in completion of a Contract.

When sold for monthly deliveries or shipment, each month's or specified part of a month's delivery or shipment, to be treated as a separate Contract.

Sellers must provide approximate weights at time of tender, and also dock or wharf samples, which must be sent by the first sellers to the first selling broker, whose name must be on the first and subsequent tenders, as holding the samples. These samples must be freshly drawn dock or wharf samples, and delivered intact to the first selling broker, but in case of any lot which has been included in the last public sale preceding the date of tender, the dock or wharf sample shown at that time shall be sufficient if reasonably intact.

Clause II.—The first buyer must receive any tender not later than 3 p.m. (Saturdays 11 a.m.), and subsequent tenders must be received by the respective buyers not later than 4 p.m. (Saturdays 1 p.m.) Should a tender be received by a buyer after the time above named, provided there has been no undue delay in dispatch, tender shall date from the following day, but weighing over shall take place as from original tender date. For the purpose of this rule the buyers shall be represented by the selling broker.

For any subsequent tender received after 1 p. m. on Saturdays the prompt to be exact fourteen days from the following Monday and during further circulation of the tender, prompt to be extact fourteen days from the date such subsequent tender is received, but weighing in all cases to take place as from original tender date. All tenders must be passed on with due dispatch, a time form being attached to first tender and passed on with all subsequent tenders, on which the time of receipt is to be marked by each person receiving it. If any intermediate buyer divides a tender he must make cut a duplicate of original time form and pass on one copy with each part of the divided tender. Tenders to be good must contain the following information, besides what is provided for by paragraph 3 or Clause 1 ;—

Date of contract and price.

Marks and numbers of packages.

Ship's name and dock or wharf where rubber is lying.

Weight of samples.

Original or Copy Arbitration Award (if any).

The stipulations in this Clause shall be deemed to be of the essence of the Contract.

Clause III.—An Arbitration Committee composed of six brokers and/or associates, members of the General Produce Brokers' Association of London, shall be appointed annually by the trade to deal with all disputes; three to form a quorum, with power to the parties in dispute to appeal to the Committee of the General Produce Brokers' Association of London, according to their Rules.

Clause IV.—When a parcel of rubber is sold under the standard description of "*first Latex Hevea Brasiliensis Plantation Rubber of fair average quality in Sheet and/or Biscuit and/or Crepe form as at present prepared*" for a specified shipment or delivery, or for shipment by a specified steamer, and found inferior, or if any portion tendered be found inferior, buyers shall have the option of rejection, and the quantity so rejected, whether the whole or any portion, shall not constitute a delivery on the Contract, but should the time for delivery have expired the seller be allowed three clear working days to replace the quantity rejected (provided that the delivery of such quantity was in the opinion of the arbitrators a *bonâ-fide* tender), otherwise Clause IX. (f) of the Rules of the General Produce Brokers' Association of London to apply.

Clause V.—When a parcel of Rubber is sold with a guarantee of quality other than as specified in Clause IV, for a specified shipment or delivery, or for shipment by a specified steamer, and found inferior, the buyer must accept the same with an allowance, provided such allowance in the opinion of the arbitrators be not more than 2*d*. (two pence) per lb. or otherwise as may be specified in the Contract, but—should the parcel, or any portion tendered, be rejected, the seller to have the option (provided that it was in the opinion of the arbitrators a *bonâ-fide* tender) of substituting guaranteed quality on the spot, to fulfil his Contract within three (3) clear working days, or the expiration of time for delivery as the case may be, otherwise Clause IX (f) of the Rules of the General Produce Brokers' Association of London to apply.

Clause VI.—Any parcel arbitrated upon and passed with or without any allowance shall be tenderable on any Contract for the same quality, and buyers shall accept the same with the original arbitration award, provided the tender is made within three months from the date of the original tender and the parcel has been left lying intact at a public warehouse.

Clause VII—Any claims under these clauses (and a copy of the objections must be sent to the parties interested) must be made by the last buyer to the first selling broker within (3) three clear working days of the last buyer receiving tender, and the first seller shall consider this as being in time, providing tenders have been passed on without undue delay.

Clause VIII.—Delivery Weight—Final delivery on any delivery or shipment Contract to be within 50 lbs. of the weight contracted for.

Clause IX.—In the event of there being more than one Contract subsisting between the same parties, which shall be closed in pursuance of Clause XI of the conditions of sale of the General Produce Brokers' Association of London, an account shall be taken of what is due from the one party to the other in respect of such Contracts, and the sum due from the one party shall be set off against any sum due from the other party, and the balance of the account, and no more, shall be claimed or paid on either side respectively.

Clause X.—The selling or buying broker guarantees the solvency of his principals in all contracts for Rubber, unless otherwise specified in the Contract.

Ceara Rubber Tapping.

The present most approved method of tapping the Ceará rubber tree and other Manihots is by chisel tapping or pricking. A portion of the surface of the tree is made smooth and clean and on this the tapper operates. A weak acid solution is usually applied to the surface and this assists coagulation. The exudation from the numerous small punctures runs together, and aided by the acid solution and the readiness of this latex to coagulate on mere exposure to air, forms a thin sheet on the prepared surface of the tree. It is then removed to be cleaned, dried and prepared in the form required.

There are several pricking tools on the market, but our attention has just been drawn to one patented by Mr. F. A. G. Pape, F. R. G. S.,—which has been specially designed for tapping Ceará. He claims, reasonably enough, we should think, that this tool will make the punctures mentioned above in a time-saving and systematic manner. At the same time the device is fashioned in such a way that the raw native can use it effectively upon being once shown, and it is so strongly constructed that he cannot damage it unless wilfully. The body of the tool consists of a steel sheet of suitable thickness, out of which the cutting chisels are punched by special process in alternate rows of, say, ten each row. The small size for young trees is about 9 inch long by 4 inch wide, and has seventy or more chisels. The puncture (3-16 inch wide) which it makes will be about $\frac{3}{4}$ inch apart each way. The chisels are so constructed that they make a hole pointing slantwise downwards, in order to facilitate the flow of the latex. A suitable handle with a thickened middle for a good hold is fastened across the back, and a push forward of no great force on the part of the operator is sufficient to drive the chisels into and through the back of the tree into the latex-bearing cells. Two set-screws are provided at each end of the centre of the rows of chisels, and are manipulated so as to prevent the tool from entering and damaging the cambium.

A second and larger size of this tool is made for use on old trees of larger diameter. In this pattern the length is about the same as the width, *viz.*, 7 inch, and the slightly hollow curved sheet which carries the chisels has a hinge in the centre, by means of which the shape of the tool can be regulated conformably with the outer circumference of the trees. Two or three turns of a screw provided for the purpose accomplish this.

In this pattern the cutting chisels are made separately, and fastened in position in the underside of the metal-sheet by means of rivets.

Another type of the tapping tool is also made, where the metal-sheet carrying the cutting blades is carried in a rigid-grooved frame with the handle and set-screw bosses in one light casting. It is in this case only necessary to renew and replace the metal-sheets when the cutters are worn out.—*India Rubber Journal.*

Collecting Cups on Plantations.

The advance made recently in cups for collecting latex on rubber plantations is of more than usual interest. Four or five years ago it was the custom to use, on many Eastern plantations, cocoanut shells in preference to ordinary leaves or bamboo cups employed in Brazil and Africa; these were popular on account of their cheapness and cleanliness, and were replaceable at a very small cost. Tin, aluminium, and subsequently galvanized iron and enamelled cups were largely used, but it was soon found that these corroded, and were apt to discolour the latex, or scrap rubber in

the cups. The place of these has been taken by glass, earthenware, and Chinese paper cups; the latter being preferred on account of their not being so easily broken and their comparative cheapness. Having run through a good variety of utensils and selected what appear to be reliable forms of collecting cups, the planters are now engaged in evolving a scheme whereby theft can be reduced to a minimum, and cleanliness maintained. The illustrations* on this page show two systems adopted in Malaya. In both cases only one cup per tree is used; in one case the cup when empty is turned, mouth downwards, and placed on the top of a stick some two or three feet from each tree, and projecting about one yard above ground; in the other case each empty, clean cup is lodged on some projection from the tree above the height of the tapping area. In each case the manager can see all the cups, and can thus detect loss by theft or otherwise; furthermore, the cups, being upturned, are clean when the tapper commences his morning round instead of being partially filled with dirt from the splashing of rain on the ground, fall of leaves, etc. As the same tree is not tapped morning and evening of the same day, one cup should suffice per tree under this system. We cannot see the reason advanced by some planters who insist on two collecting cups for each tree tapped on alternate days.

Funtumia Elastica.

There are two ways of tapping this tree for latex *i. e.*, the excision and the incision system.

By the excision method deep cuts as far as the cambium are made, while by the incision system only shallow channels are opened, just deep enough to allow the latex to run down the tree; incisions are then made into these channels by means of a pricker.

Of the incision tapping, the most satisfactory results, so far as the quantity of latex is concerned, were obtained from the spiral system; this gave in comparison with the total length of cuts the highest yield of latex.

Taking it all round, however, the experiments carried out with the excision method have been very disappointing. Trees tapped last year for the first time, and tapped on the same area this year gave only one-tenth of the amount of latex yielded last year. This shows that a tree has to be given many years rest after one tapping before it can be profitably tapped again.

There seems to me little doubt left that the incision tapping by means of a pricker is the right method for Funtumia trees, as there is comparatively little damage done to the plant and, as Dr. Christy of Uganda assured us, a tree can be tapped three times a year without showing a decrease in yield.

Experiments were also made in connection with the preparation of Funtumia rubber.

Of cold methods, *i. e.*, coagulation without boiling the latex, purub and acetic acid had no effect on the Funtumia latex. Good biscuits can be prepared by adding formalin or absolute alcohol to the latter. But there is no reason why the native should use expensive chemicals for the preparation of this rubber, as good thin biscuits can just as well be made by simply boiling the latex and then washing and pressing it, the principal thing being to boil as small a quantity of latex as possible at a time, so as to ensure the preparation of very thin biscuits. The latter are then easily dried. (Report on Forest and Agriculture in Southern Nigria).

* Not reproduced here.

SELECTED CUTTINGS.

When Should Manure be Applied in India.

The following valuable paper by Dr. Leather, which appeared in the January number of the *Agricultural Journal of India*, is reproduced *in extenso* because, though in it he deals with annual crops and districts in Northern India, all of what he says applies also to Coffee and Tea and to South India.

The rainfall in a typical Coffee district may be divided into four distinct periods. In April and May there is a period of light rains, from June to August a period of heavy rains, and in September and October another period of light rains, and, finally, from November to March a period with practically no rain at all.

Dr. Leather shows that soluble fertilisers, like Saltpetre and Nitrate of Soda, should not be applied before a period of heavy rain or they will be washed out of the soil, or out of the reach of roots. Hence such fertilisers when applied to Coffee should be put out either in March, or better still in September. This is a point to which I have several times called attention, and Dr. Leather's paper indicates that applications of manure to Coffee should be divided; the soluble portions should be applied in September or October, and the insoluble and bulk manures in May.—R. D. A.]

Two principles are acted on in the application of manure; the one being the most advantageous season to put it on the land, the other the most suitable crop to give it to. It is in relation to the former that the following suggestions apply :—

Fertilisers, whether soluble in water before being put into the soil or not, must all become soluble before they are of service to the plant. Some, such as the "bulky" manures, farmyard manure, compost, refuse, indigo-seeth, and such like are in part soluble at first, and become more so as decomposition sets in: oil cakes are similarly placed. Others, such as Indian saltpetre, Chili nitre, or sulphate of ammonia, are entirely soluble in water. Superphosphate of lime is soluble in so far as its most important constituent, calcium hydrogen phosphate, "soluble phosphate," is concerned. The finely ground rock phosphates, basic slag or bone meal are so nearly insoluble in water that they are classed as "insoluble" though it is well known to the agriculturist that they must be so far soluble that they can serve the plant; otherwise they could not play the part they do.

But since such materials must be soluble in order to be useful, it is evident that the amount of water in the soil and the rainfall must have an important relationship to the employment of such materials. This factor has been recognised in Europe, but our Indian agricultural literature is without serious reference to it.

The problem is this. If we have a certain manure to put on the land, does it matter when it is applied, or must we select a particular month of the year or a particular season for the purpose? This largely depends on whether the material is "soluble" or not, because if it is soluble, heavy rain may wash it away from the region in which the plant-root development is taking place. For example, Aikman in his "Farmyard Manure" (page 43), says :—"As to the depth to which it is advisable to plough the manure in, it may be here noticed that it should not be too deep, so as to permit of the cess of sufficient moisture to ensure proper fermentation, and to prevent rapid washing down of nitrates to the drains." And again in his "Manures and Manuring" (page 479), he says: "Nitrate of soda should never be applied

before the plant is ready to utilise it" and "the use of such as fertiliser in a damp season is less likely to be economical than in a dry one." Such general principles are well known; the sentences quoted were naturally written for British farmers; they are simply an expression of the necessity for considering the current water supply as well as the nature of the fertiliser.

In India then it is important to apply these principles also. Since the fertiliser has to be brought into the soil at such a depth that it may be at the service of the plant, and yet be not washed away by drainage, consideration of the rainfall is a key to the right solution of the question. We may state it thus:—What rainfall do we require (if any) to wash our manure, or the soluble part of it, into the stratum of the soil in which the plant is feeding, and what probability is there of it being carried too far down into the sub-soil?

In Europe the question is answered briefly thus:—bulky manures and oil-cakes should usually be ploughed into the land before the crop is sown, though some people put farmyard manure on the surface after the crop has germinated (*i. e.*, it is not ploughed in at all). Similarly the "insoluble" fertilisers such as basic slag or superphosphate are ploughed into the soil before sowing; but the very soluble materials like the saltpetre or sulphate of ammonia are more commonly broadcasted on the land after the crop has germinated; indeed when the crop is sown in the autumn such materials are not put on the land until the spring time, because during the winter, plant growth is very slow and fertilisers are more useful in the spring time when growth is rapid.

This practice is based on the general rainfall. Broadly speaking, this is distributed uniformly over the whole year; each month receives its quota, rarely less than 1 inch, generally more. One inch of rainfall if it falls mostly within a few days in Europe is ample to wash a soluble manure well into the soil. It is probable that drainage would occur, but the fertiliser is not necessarily carried into the drains. When rain falls, for the most part it merely displaces water already in the soil (assuming no drought to have occured) and some of the *latter* water finds its way into drains. Even 2 inches of rain, falling within a few days, would not itself pass further than 12 inches deep, and in most cases it would reach a less depth than this. Hence it follows that in Britain it is quite safe to apply soluble manures, and even farm manures as a "top-dressing." Whether it would be equally good practice to put the former into the soil before sowing is another matter. Other considerations play a part. Not merely do we desire to prevent such materials from passing away in drainage water; we must recollect that they may be lost to the plant in other ways, such as by bacterial changes. The latter simply make it generally desirable to present soluble manures to the plant as nearly as possible when the plant can use them.

It becomes then a question to consider in how far our Indian rainfall will indicate the most suitable mode of applying fertilisers. It will be most convenient to take the case of saltpetre first, because it is entirely soluble to start with, and will be carried with any water that happens to be present. Considering the two great divisions of crops, *rabi* and *kharif*, it is generally assumed that if saltpetre were used for the *kharif* it would be washed away before the crop could use it. Of the *possibility* of this happening there can be little doubt. For the sake of example I will consider the part of India where I reside—Behar. On the average between 5 and 10 inches fall in June mostly in the latter part. in July the mean fall is between 10 and 15 inches. Now at the close of the hot weather, and assuming the land to have been already ploughed a single fall of 5 inches would be taken up by the soil and

would distribute itself largely in the first and second or first to third feet. Under such circumstances it would be a mistake to put saltpetre on the land before the first rain. But the general practice is to cultivate the land during the first break succeeding the first fall of rain when the soil is nicely moist without being too wet and seed is sown on this. Supposing then that saltpetre were used at this time and 5 inches of rain fell some time in the next fortnight, it would be sufficient to displace the whole of the water in the first foot, and since this displacement is not perfect, some of it would find its way, may be, into the second foot. In this case also the fertiliser would be carried to the stratum in which the young plant wanted it, unless, indeed, the latter had developed unusually fast. On the whole, it would be an unsafe practice to sow saltpetre with the seed. But supposing the crop is allowed to grow, say, 6 or 8 inches high and the saltpetre is then put on, it is improbable that it would be carried beyond the stratum in which we require it. The root development will have extended beyond the first foot, the crop transpires at this stage probably 2 to 5 lbs. of water per sq. foot per day (4" to 1·0"), and unless the fall of rain succeeding the application of saltpetre were unusually heavy, such as 102 on one day, or say during three succeeding days, the fertiliser would be where the plant required it. I have assumed rather extremes throughout in order to show what both the possibilities as also the probabilities of the case are. Nor have I instanced the use of saltpetre as a top-dressing for a young crop in July in order to *recommend it*; it is probably more suitable for another season, but there would be no risk of the manure being washed away out of the area of the root range. So far as I can tell from my soil moisture records at present "top-dressing" with saltpetre in Behar in July would be successful in most years.

We may also consider the case of Cawnpore. This soil holds probably about as much water as the Behar soil does. The following is a statement showing the fortnightly rainfall in the second half of June and the month of July for the last nine years; and an inspection of it indicates what the probabilities are of a soluble fertiliser like saltpetre being carried by heavy rain out of the reach of a young crop. In two years, 1904 and 1899, this risk would have been serious but in the remaining eight years such a manure might have been safely used as a top-dressing.

Cawnpore	June 15th to 30th	July. 1st to 15th	16th to 31st.
1906	6·55	4·76	2·21
1905	...	5·62	2·52
1904	3·77	5·67	11·13
1903	1·72	...	0·77
1902	...	2·35	4·57
1901	...	4·66	2·99
1900	1·16	2·67	2·56
1899	5·50	4·85	15·52
1898	2·09	3·85	5·67
1897	1·20	0·94	5·022

We may turn to another example, namely, Dehra Dun. There the soil is generally stony, and although there are some areas of stiff land, the greater part would certainly not hold, per cubic foot, nearly so much water as the Behar soil; most of it could not hold more than half as much. Consequently any particular rainfall would displace water to a much greater depth than in Behar, and soluble fertilisers would pass correspondingly deeper. Add to this fact that the rainfall is considerably heavier, and it becomes clear that in most years such fertilisers could not there be employed profitably to a rains crop.

We may next turn to the *rabi* season as exemplifying a rainfall characteristically different from the *kharif*. There is a general belief that such soluble fertilisers as saltpetre may be most economically applied to the cold weather crops. Such a belief is possibly sound. The average rainfall over nearly the whole of India from October to April is only a few inches and is generally insufficient to cause drainage; part of Eastern Bengal and Burma forming perhaps the only exception. Consequently the risk of loss of such soluble plant food from this cause is normal.

The question then follows whether the fertilisers should be ploughed into the land before sowing the crop or be put on as a "top-dressing." Taking Behar again as an example, the monsoon proper is expected to continue well into September and drainage does not usually cease until the end of that month. During October anything from 2 to 5 inches may be expected falling on an average of days, that is, it is commonly fairly good rain. November and December are usually rainless. It follows, therefore, that if manures are to be used at all, they must be applied in October, and it seems clear that the proper course to pursue would be to plough them in with the last ploughing before the seed is sown. Top-dressing would in most years be useless, for the manure would remain on the surface, or at least diffuse into the soil only slowly.

Turning to Dehra Dun again the circumstances are different. October has its showers usually like October in Behar, but the temperature is so much lower during November and December that crops are held back and they mature fully a month later than in Behar. In addition to this there is nearly always some rain at the end of December or in January and fertilisers which had been put on the growing crop immediately prior to the rains would be sufficiently well washed into the soil to enable them to play the part they do in Britain. Thus, top-dressing for the *rabi* crop in Dehra Dun would generally be successful.

(*To be continued.*)

Inferior Quality Teas.

At a meeting held at Calcutta on the 14th ultimo, the Committee of the Indian Tea Association had before them a letter, dated 13th February 1911, from Messrs. Brooke, Bond & Co., drawing attention to the condition of certain teas sold in the Calcutta auctions. It was Messrs. Brooke, Bond & Co.'s opinion that a number of teas now printed in the auction catalogues, are unfit for human consumption. In former years teas of this class were sold for chemical purposes only; but recently, with the higher prices ruling, producers had obtained better rates by offering them in public sale. The teas were bought for the bazaar trade only, and a large quantity of most undesirable stuff had recently found its way into the bazaar. Messrs. Brooke, Bond & Co. expressed the opinion that the distribution of teas of this class must eventually have a very bad effect on the progress of consumption in India. For it was obvious that, although a consumer might be tempted, by reason of the low price, to buy the tea, it was unlikely that he would continue to do so. Certain samples selected from the last public auction were forwarded with the letter for inspection.

The matter was discussed by the Committee, who directed that Messrs. Brooke, Bond & Co.'s letter should be forwarded, together with the samples, to the Calcutta Tea Traders' Association. It was considered to be altogether undesirable that teas out of condition should be sold in the public auctions; and it was the opinion of the Committee that such teas should be reported on by the brokers, and that they should then be disposed of for chemical purposes only.

The Planters' Chronicle.

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THE U. P. A. S. I.

(INCORPORATED.)

The International Rubber Exhibition, 1911.

Subscriptions received on account of the International Rubber Exhibition Fund of the Association are as follows :—

Malabar Coast Planters' Association (at 4 annas per opened acre of estates.)

	Rs.	a.	p.	Rs.	a.	p.
Messrs. Aspinwall & Co.	50	0	0			
,, Peirce, Leslie & Co.	75	0	0			
Mysore Syndicate	16	4	0			
Cochin Rubber Company	250	0	0			
Palapilly Estate	185	4	0			
Mooply Estate	277	3	6			
Pudukad Estate	205	7	5			
Pullengode Estate	132	4	0			
Cochin Government...	300	0	0			
Periyar Rubber Company	221	0	0			
Central Malabar Rubber Syndicate ...	125	0	0			
Kerala Rubber Company	350	0	0			
Kaliar Rubber Company	171	10	0			
Thodupuzha Rubber Company ...	181	0	0			
				2,540	0	11
South Travancore Planters' Association				1,583	6	0
Shevaroy Planters' Association (per Bernard Cayley, Esq.)				504	0	0
Central Travancore Planters' Association ...				63	8	0
South Mysore Planters' Association				42	8	0
Kanan Devan Planters' Assn. (E. E. Williams, Esq.)...				25	0	0
				Rs.4,758	6	11

Arrangements are being made for the printing of the booklet relating to Rubber in South India and the despatch of a number of framed photo-

graphs to be hung in the South India stall. Some of the photographs received are highly artistic, and a very nice collection is likely to be made.

Mr. Richardson, who will superintend arrangements when he arrives in London, states that some special exhibits of rubber will be sent for competitive purposes, and that Mr. Hall has been good enough to promise a collection of sporting trophies.

Planters are specially requested to kindly urge any retired planters *in Europe* who are known to possess sporting trophies and other articles likely to prove useful for decorative purposes at the Exhibition, to lend these for the occasion. Messrs. Rowe, White and Co., Ld., of 4 Lloyd's Avenue, London, E. C., would no doubt be very pleased to take charge of them, and the Home Committee would see that they were properly displayed.

WHAT OTHERS ARE DOING.

It is advisable that planters in South India should have an idea of the strenuous way in which their rivals in the Straits Settlements and Federated Malay States have taken in hand preparations in connection with the above Exhibition.

The latest number of *Grenier's Rubber News* contains a special article on the subject, from which the following extracts are taken:—

" A representative of *Grenier's Rubber News* had a special interview last Saturday with Mr. Lewton-Brain, the Director of Agriculture, F. M. S., 11th March 1911, in order to glean what preparations are being made to ensure a worthy representation of Malaya, the great rubber country of the East, at the forthcoming Rubber Exhibttion to be held in London in June next. We are already in possession of the fact that the island of Ceylon, which knows so well how to advertise her scenery, her products, and in fact everything connected with herself, intends to make a great show at the Exhibition, and we only trust that Malaya will go one better, and maintain its reputation as the leading rubber country in the Middle East. Our new Director of Agriculture and also that other eminent agricultural authority, Dr. H. N. Ridley, the Grand Old Man of Singapore, we know, are sparing no pains, nor sacrifice to their own personal convenience, to do all they can to see that the representation of this country is worthy of it. Mr. Lewton-Brain has already taken a number of photographs connected with the rubber industry, and before he has finished he hopes to have a splendid show of pictures depicting various rubber estates, and well-known places in the country. At the last exhibition the absence of photographs constituted a weak spot in the Malayan Show, but the defect is to be remedied this year and the photographs will be a feature in the Exhibition of 1911. There will also be interesting models of a rubber-factory, a planter's bungalow and cooly lines. These will be grouped together covering an area of about the size of a billiard table, and in order to make them the more realistic it is intended to have a model, to be made in London, of a miniature up-to-date clean weeded estate which would do the hearts of such men as Messrs. Pears and Lake good to see, with miniature rubber trees and other accessories, so that the visitor will understand all the more easily what an up-to-date rubber estate in Malaya actually looks like. . . . No exhibit of less than 25 lbs. of rubber will be accepted. . . . The exhibits will be examined and passed by a sub-Committee. . . .

" Mr. Brain told our representative that in addition to the photographs above mentioned it is intended to exhibit a mass of statistics comprising amongst other figures the total yield of rubber year by year since its cultivation, the growth of the exports, the growth of the labour supply showing

separately the growth in immigrants such as Chinese, Tamils, Telugus, and Javanese, the increase in girth of rubber trees from the first year onwards and kindred information.

"Special charts and maps are being prepared for exhibition, while a couple of pamphlets are all being compiled. Dr. Ridley is writing one on the history more or less of the cultivation of rubber in Malaya generally, while Mr. L. C. Brown, the Cocoanut Expert, is inditing a pamphlet on what constitutes the second industry in this country. These will be embodied in attractive covers, and will be on sale at the Exhibition.

"Agreements are also being made for the Exhibition of bye-products such as oil-seed, seed cake, and cocoanuts. It will be seen therefore that the Government is alive to the paramount importance of an adequate representation of this country, and it goes without saying that the planters on their part may be relied on to send in from different parts of the country both in quality and quantity, and in time for early despatch, a representation which will not only sustain but enhance the rubber reputation of this country."

Nilgiri Planters.

A similar informal meeting to that which was held recently at Kotagiri was held at Kullakamby on 10th March to meet Mr. Anstead, the Scientific Officer. The most important matter discussed was the cultivation and preparation of Ceará rubber which has proved a success in the district.

The Green Bug (*Lecanium viride*) is decidedly less, the heavy monsoon experienced last year having considerably reduced it. Mr. Anstead advised that all the coffee killed, or very much weakened, by the Green Bug, together with that planted upon poor land and liable to attack, should be replaced by Tea or Ceará rubber, and efforts concentrated upon the good coffee which might be kept free from scales by washing with insecticides. A succession of wet years will probably reduce the pest to a stage at which it can be controlled with comparative case.

National Bank of India, Limited.

In a letter dated Madras, 11th March 1911, the Manager writes:—

"I have the pleasure to inform you that I have this day received a telegram from my London Office giving particulars of the Bank's working for the year which ended on the 31st December last.

"The net profits for the year, including the amount brought forward, amount to about £356,000, out of which the Directors propose to pay a Dividend for the half-year at the rate of 12% per annum, to apply £10,000 in reduction of House Property Account and £10,000 to the Officers' Pension Fund, leaving a balance of £240,000, of which the Directors propose to capitalize £200,000 by the issue of 16,000 Bonus Shares of £25 each, on which £12-10-0 will be credited as paid, the shares to be allotted to existing Shareholders in the proportion of one share to each 4 shares held.

"The remaining balance of £40,000 to be carried forward to the present half-year."

"The Planters' Chronicle."

Vol. V/2 will be ready in a few days and will be supplied at Rs.3 per copy per V. P. P.

Index for the whole of the year 1910 is now available. The charge for this will be 8 annas a copy per V. P. P. It is so arranged as to show the contents of Vols. V/1 and V/2 separately, in order to facilitate reference.

Planters' own copies of Vols. V/1 and V/2 can be bound at Re.1 per copy (inclusive of index and postage charges).

DISTRICT PLANTERS' ASSOCIATIONS.

Wynaad Planters' Association.

Proceedings of a General Meeting held at Meppadi Club on March 8th, 1911.

PRESENT.—Messrs. Atzenwiler, Howland, Macleod, Parker, Powell, and C. E. Abbott, Honorary Secretary. *Visitors* :—Messrs. Dickson and Macbeath. Mr. Atzenwiler in the chair.

1663. *The Proceedings of last Meeting*—were confirmed.

1664. *Subscriptions and Membership.*—Read report of committee appointed to check list of subscriptions under new rule. The Honorary Secretary has sent out notices of amounts to members.

1665. *Resignations.*—Captain Carslake's and Mr. A. Brown's resignations were accepted with regret.

1665. *Tea Cess Committee and Bonus on Green Tea.*—The Honorary Secretary was instructed to thank Mr. Jackson on behalf of the Association for his efforts to secure the Bonus on the export of Green Tea at the recent Meeting of the Cess Committee.

1666. *Proposed Veterinary Hospital in Wynaad.*—After reading correspondence on this subject, the Meeting was of opinion that the most suitable site would be at Kalpetta.

1667. *Roads.*—Read copy of letter from District Board Engineer to Assistant Engineer regarding Road 38. Recorded with satisfaction.

Read letter from District Board Engineer to Honorary Secretary stating that the matter complained about by Mr. West on Road 35B had had his personal attention. Read demi-official letter from Collector of Malabar about Vellera Mulla road. The Honorary Secretary was instructed to address the District Board Engineer on the subject of the road from Sultans Battery to Cherambadi.

1668. *Poodapardy Hotel.*—The Honorary Secretary stated that he had paid C. Chungaren Rs.50 for repairs of building. Approved. He also stated that he had paid the Post Office for the bags which the Postmaster-General has sanctioned being made up at Vayitry and Tambracherry for conveyance of correspondence to the Hotel.

1669. *Coffee Cess.*—Read letter from Secretary, U.P.A.S.I. Noted.

1670. *Timber and Fuel Trees.*—Read letter from Mr. Anstead on the subject of quick growing trees suitable to supply timber and charcoal. The trees recommended by the Forest Department are *Cullenea excelsa* (Tamil *Malai Konji* or *Vedeepla*) and *Calophyllum inophyllum* (Tamil *Ponnay*).

1671. *Legislation against Thefts of Produce.*—Read circular 14/11, U.P.A.S.I. The Association hopes that Government will give its early attention to this subject.

1672. *Papers on Table.*—Report of Agricultural Department, Madras, I. T. A. circulars.

1673. *Meppadi Club.*—Resolved that the Association pay Rs.30 as a contribution to the Meppadi Club for current year.

Vote of thanks to the Chair.

(Signed) H. ATZENWILER, *Chairman.*

(„) C. E. ABBOTT, *Hon. Secretary.*

INDIAN TEA ASSOCIATION, CALCUTTA.

Extract from Proceedings of the Thirtieth Annual General Meeting of Members of the Association, held on Friday, the 17th February 1911.

The Chairman presented the report for the year ended 31st December 1910, and in so doing addressed the meeting in the following terms :— . . . . A year ago I ventured to say that " By reducing the death rate throughout the tea districts, which more fully organised sanitary measures would almost certainly accomplish, we should make a very substantial advance in the solution of our labour troubles." A recent tour in the tea districts of Cachar and the Dooars confirms me in this opinion. Everywhere the view is expressed that the increased use of quinine as a prophylaxis against malaria has done much to maintain the workers in good health, and has enabled them to escape the various ailments to which the debility caused by repeated attacks of malaria so frequently left them an easy prey. The improvement in health amongst the planting community consequent on the more extended use of mosquito-proof rooms, and the practically general and regular use of Quinine is a marked feature of recent times. . . . .

Another question of great moment is the working of the Scientific Department. Since its inception ten years ago under the able guidance and quenchless euthusiasm of Dr. Mann there can be little question but that the industry has received excellent value for its share of the money spent. For years past now tea concerns have profited by the work of the Department in consequence of the publicity given to the best methods of working. These are no longer confined to the few but are available for the whole body of planters. Whilst the influence of the earlier scientific publications regarding tea cultivation and manufacture is doubtless notable (I would specially mention those of Mr. Kelway Bamber in 1893 and Dr. now Sir George Watt in 1898)—I consider that much of the earlier work in this Department failed of its full effect because of the lack of personal propaganda in the districts. The tours of Dr. Mann materially quickened the interest of planters in improved methods of working, and it is therefore instructive to apply the test of yield to the areas under tea before and after the publication in 1903 of the second edition of *The Pests and Blights of the Tea Plant*, and *The Principles of Tea Pruning*, both written, in collaboration, by Sir George Watt and Dr. Mann.

In the three years ending 1900 the average crop of tea per acre in India was 418 lbs., in the three years ending 1903 it was 400 lbs., in the three years ending 1906 it rose to 449 lbs., and in the three years ending 1909 it further advanced to 487 lbs. Though absolute accuracy cannot be claimed for the production figures, they are sufficiently close to the facts to form a reliable index of the yield per acre. It is, I say, noteworthy that since the operations of the Scientific Department had time to take effect the level of the six years ending 1903 has been surpassed by 11 per cent. in the three year period ending in 1906 and by 20 per cent. if we take the average of the three years ending 31st December 1909. I shall not attempt to estimate exactly how much of this is due to the work of the Scientific Department. We know that there have been various other influences, climatic and economic, in operation, including a gradual increase in the use of fertilizers, but I regard it as beyond question that a substantial part of this increase in productivity is attributable to the improved methods of working which have been popularised by the Scientific Officers. Then in the department of manufacture important improvements now generally adopted in connection with fermenting and firing have enabled producers to materially

improve the quality of tea. When it is remembered that 3 pies per lb. on the Indian crop equals 40 lakhs of rupees per annum, and that even 5 per cent. increase on the average yield of the six years ending 1903 represents, at the prices now ruling, an annual revenue of about 45 lakhs, some idea may be gained of how even small improvements in yield or quality affect the industry. I do not forget that there is another aspect of increased production but happily there is no need to consider it seriously to-day. Grants from the Imperial and Provincial Governments for a further period of five years, for which we are grateful, together with subscriptions from the various Branches, and from this Association, will enable us to formulate a programme of work with some hope of continuity. In connection with this we must take care that the aim of applying scientific research to practical ends is not lost sight of.

It has been proposed that the Scientific Officers should have their head-quarters at a common centre, preferably in Assam, and this proposition has been generally approved. Opinion is somewhat divided as to whether the Scientific Officers should themselves carry out experiments on plots under their immediate care, or supervise experiments at selected estates where the management is found able and willing to co-operate in such researches. The difficulty of securing a guarantee of an adequate labour force at an experimental station unfortunately renders the first course impossible at present. The remaining difficulty which we have to face is the provision of housing at a central place for four officers. Without a capital fund it is impossible to build, and it may not be practicable to lease suitable premises, but in view of the advantages already derived from the work of the Department, the industry will surely be prepared to supply the funds needed for building if no other course is practicable. These matters will, however, engage the attention of the General Committee, and they will have the advantage of consulting with the district representatives on the Tea Cess Fund who have been asked to confer with us as representing the tea districts in matters pertaining to the Scientific Department. The programme of work for the current year will also be considered at this Conference. It is matter of regret that, in spite of the time devoted to the study of Mosquito Blight, it cannot yet be said that we have travelled far. We haye some knowledge of the life history of this dangerous pest, but have yet to discover a remedy for its depredations which will in the matter of cost prove that the remedy is not worse than the disease. We must ever keep before our Scientific Officers the financial side of the question. Our aims are practical, and research which ignores this is of little value. We must also be patient, for further gains to the industry from new and hitherto untouched fields of enquiry may not be so readily available as from the surface workings which have hitherto yielded ready material for practical use. Changes in the personnel of the officers have in recent years interfered with continuity. We can only trust that Dr. Hope, and the other Scientific Officers now conducting investigations, and those who are to be added to his staff will press forward with their work and be able annually to render as good an account of their stewardship as those who have preceded them—(*Applause.*) . . .

Dr. G. D. Hope said :—Mr. Chairman and Gentlemen.—It is customary on this occasion to give a short account of the progress which has been made by the Scientific Department during the past year.

Referring in the first place to problems of tea manufacture—the conditions under which the essential oil, which is developed during the fermentation, is driven from the leaf during drying have been investigated, and it appears that least essential oil is lost when the bulk of the water in the tea is

removed rapidly and at as low a temperature as possible, this condition being obtained in firing machines by thin spreading of the leaf and by the use of a strong current of dry air. Our investigations have indicated, however, that it may not be desirable from the point of view of flavour to dry in this way throughout, but that these conditions should be maintained at any rate during the stages of firing at which the leaf still contains a considerable quantity of water.

I do not anticipate that any decided improvement will be made in existing methods of tea manufacture until the reasons which underlie the chemical and physical changes which tea leaf undergoes during each separate process of manufacture have been fully and separately investigated. An incomplete study of one or more of the different processes of manufacture does not justify our making definite pronouncements as to the best means of manufacturing tea.

An investigation of the physical properties of the more important types of tea soils is in progress. When this is completed I hope that it will form a valuable addition to Dr. Mann's studies of the tea soils of N. E. India.

Mr. Carpenter has spent a large part of the year turning in Assam and during these tours he has carefully studied the manuring problems of the district in the way to which Mr. Stuart has referred.

The work of the Entomologist has naturally been handicapped by his absence on leave, but further investigations have been carried out with regard to Mosquito Blight and progress has been made in the study of the life history of the Green Fly of tea, its egg site having been definitely established.

As Mr. Antram will shortly be giving up his appointment as Entomologist to the Department this may be a fitting occasion for recording my personal appreciation of the work he has done in studying the pests of the tea plant.

I should like to refer also to the investigations which have been carried on during the past year by the Imperial Economic Mycologist and his colleagues.

Among other enquiries, they are carrying out an investigation of the canker of tea and of a disease of tea seed which is of frequent occurrence. The latter is due to the presence of one or more common species of fungi in or between the Cotyledons of the seed. The difficulty with regard to this disease is to understand how the fungus gets into the seed. It now appears probable that the insect which usually passes uuder the name of the tea seed beetle may account for the presence of the fungus by puncturing immature tea seed and thus allowing of the entrance of the fungul spores.

Another important investigation has recently been carried out by Mr. McRae, now Mycologist to the Government of Madras, a reprint of his article on Blister Blight in the Darjeeling Tea District forming one of the pamphlets issued during the present year.

The number and value of these investigations indicates the necessity of our having a Mycologist of our own. The appointment of such an Officer would bring about the completion of the full scheme originally laid down by Dr. Mann.

I should now like to refer for a moment to the present position of the Department. A change of organisation is contemplated which will, I think, be beneficial to its best interests. This is the placing at one central experimental station of the Assistant Scientific Officer, the Entomologist and the Mycologist. The scheme which I have in mind is as follows :—The Sibsagar

District of Assam in which our first Experimental Station was situated has proved as satisfactory a locality as can be found, and I would put the new station in this district, and as near the Assam-Bengal Railway as possible, other conditions being suitable. Two bungalows and a joint laboratory will be required. I think we should have sufficient land under our control to allow of our attracting a certain number of villagers for incidental work and our area should contain some good tea land so that if necessary we could put out a small acreage of tea for experimental purposes at a later date. It would be of importance to estabiish ourselves upon as independent a basis as possible, particularly as regards labour, but at the same time since we are abandoning for the present the idea of having direct control of an area of mature tea, it would be necessary that we should be situated sufficiently close to tea gardens to enable us to continue our studies of the tea bush and tea garden operations.

This is merely an outline of a scheme which needs careful elaboration, for which this is not the occasion.

The resolution was then put to the meeting, and it was declared by the Chairman to be carried unanimously. . . .

Mr. C. D. Inglis moved and Mr. S. G. Anderson seconded a resolution :—

> " That the rate of subscription for the current year from each garden belonging to the Association be fixed at one anna per acre under tea cultivation."

The Chairman moved as an amendment to the resolution :—

> " That the rate of subscription for the current year from each garden belonging to the Association be fixed at one and a half-anna per acre under tea cultivation."

Mr. G. Kingsley seconded the amendment, which was put to the meeting, and was declared carried.

Extract from Abstract of the Proceedings of a Meeting of the General Committee held on the 28th February, 1911.

Election of Chairman and Vice-Chairman.—On the motion of Mr. R. R. Toynbee, it was unanimously resolved that Mr. W. Warrington be elected Chairman of the Association for the year. It was further unanimously resolved that Mr. H. C. Begg be elected Vice-Chairman.

Scientific Department.—The Chairman, the Vice-Chairman and Mr. W. A. Duncan were unanimously elected to form the Sub-Committee to direct and to control the working of the Scientific Department for the year. Several matters of detail connected with the management of the Department were to be referred to the Sub-Committee for disposal.

Western Siberian Exhibition, Omsk, 1911.—On the 2nd February the General Committee forwarded to the Indian Tea Cess Committee, papers which they had received from the Government of India, regarding this Exhibition, which is to be held at Omsk during the current year. The main object of the Exhibition is understood to be to display the agricultural life and industries of Western Siberia, her products, methods of production, etc. The question of arranging for a representation of Indian tea at the Exhibition had been raised, but the Tea Cess Committee doubted if useful results would follow action in that direction. They had accordingly decided not to be represented.

This decision was noted by the General Committee, who directed that the papers should be recorded.

TEA.

The Chemistry, Physiology, and Aesthetics of a Cup of Tea.

ULTIMATE *v.* PROXIMATE ANALYSIS OF TEA INFUSION.

From "The Lancet" of January 7 we quote the following interesting article,—which is described as a contribution from "'The Lancet' Laboratory":—Chemistry is not always able to offer a satisfactory explanation of the aesthetic quality of an article. It is doubtful, for example, whether chemical analysis could show any appreciable difference between a good and a bad tobacco, but the aesthetic difference is easy enough to discern. Again, analysis of an elegant chateau wine reveals comparatively no explanation based on chemical conception for its refinements; *vin ordinaire*, though very inferior to the palate, shows much the same results on chemical analysis as (say) Chateau Lafite. The case is the same with tea. Tea apparently is not judged by its chemical qualities, but by its practical qualities, which are determined by the expert tea-taster. In addition to examining the appearance and condition of the leaf he studies very carefully the characteristics of the infusion, its strength or astringency, its flavour, its colour, and its odour. His judgment decides the commercial value of the tea, but whether this judgment means that his valuation is in the economical and physiological interests of the consumer does not appear to have received any extended study.

In most of the chemical literature of the subject it is freely conceded that while a chemical analysis will indicate the strength but not the flavour of the infusion, it is of little use in the valuation of high-priced teas, and this conclusion is drawn in spite of the fact that many thousands of analyses of tea have been made. In the present article we shall attempt to indicate that a very interesting agreement does appear to exist between certain points in the chemical analysis of a tea and the views of the expert tea-taster, provided that the chemical analysis is directed not so much to the percentage amounts of the constituents present as to the relations of these constituents to each other. The question has not been satisfactorily cleared up as to whether these constituents exist in a state of combination, but, if so, it is interesting to ask what are the compounds. What is indicated, therefore, is a proximate rather than an ultimate analysis. To draw an analogy, we have not been content to know merely that there is sodium and that there is chlorine in the sea; we go further, and have found out that these elements are combined in definite quantities to form common salt. Can something of this accuracy be arrived at in respect of tea?

THE COMMON ACCEPTANCE OF INJURIOUS SUBSTANCES IN TEA.

Undoubtedly the important constituents of tea, as everyone knows, are the alkaloid caffeine (or theine) and tannin. Both, from the physiological point of view, are drugs, the pharmacology of which is well known, but tannin is generally more unfavourably regarded than caffeine. Tannin, in fact, is commonly looked upon as the source of mischief in excessive tea-drinking. Text-books frequently state that when the tannic acid which tea contains occurs in large quantities, the pepsin of the gastric juice is precipitated; and that this is one of the reasons why tea is not a suitable beverage for persons suffering from gastric disturbances, while among the more prominent symptoms of excessive tea-drinking are gastric disorders, cardiac distress, and a variety of nervous symptoms, such as excitability, sleeplessness, and muscular incoördination. It is a remarkable commentary upon the disfavour with which tannin in tea is looked upon that some of the finest

teas (from the tea expert's point of view) upon the market and commanding high prices are just those which contain the largest amount of tannin. A cheap Ceylon tea, for example, was found to yield 5·46 per cent. of tannin in the cup, while a high-priced Ceylon tea showed 7·56 per cent. of tannin. Similarly, a cheap Indian tea gave 5·88 per cent. of tannin to the infusion, and a high-priced Indian tea gave 10 per cent. of tannin, the teas in each being prepared under analogous conditions. It is again an interesting commentary on the bad name which is given to tannin in tea that a dose of red wine contains more tannin than does a dose of tea. Half a pint of claret, for example, contains on the average 10 grains of tannin, while a cup of tea made with a teaspoonful of leaf (average 60 grains would contain 6 grains only of tannin. Some teas would, however, yield only half the quantity of tannin in the cup. Tannin in wines, moreover, is in the free active state, in tea it is neutral or fixed. All infusions of tea are alkaline, and they are incapable in that state of acting as a tanning agent. Good teas do not precipitate proteins, nor will they make leather, as is so popularly assumed, the fact being that the tannin in tea is engaged in other directions—an engagement from which it is difficult to divert it. To resume our analogy, with which we started, we do not expect common salt solution to have bleaching properties on account of the chlorine contained in it, for we know that the attention of the chlorine is confined completely to the sodium. In the same way the tannin in most teas is engaged, and so rendered inoperative as an astringent or tanning material.

Evidence of Caffeine and Tannin Existing as a Compound in Tea.

When a warm tea infusion is just acidified with a weak solution of hydrochloric acid the colour of the infusion changes from the well-known reddish-brown to a much lighter colour. At the same time a flocculent precipitate is formed which increases in quantity as the infusion is cooled. The amount of precipitate collected varies with different teas, the China teas yielding the least and the Indian teas the most. The precipitate proves to contain, amongst other things, tannin and caffeine, and, whatever kind of tea is employed, a ratio of 1 to 3 of caffeine to tannin is generally found, which indicates that there is present a real caffeine tannate, having perhaps a formula approximating to the following :—

$C_8H_{10}N_4O_2$ (Caffeine.) $C_{20}H_{20}O_9$ (Quercitic acid.)

This experiment points distinctly in favour of the conclusion that an infusion of tea is essentially a solution of caffeine tannate in an alkaline medium. When the alkaline salt present in tea is neutralised by the addition of a weak acid, caffeine tannate is gradually thrown out, this substance being only slightly soluble in cold, but readily soluble in hot water. Now, an infusion of tea as soon as it reaches the acid contents of the stomach would undergo a similar change—that is to say, the human organism is then dealing with a fluid containing part of its caffeine tannate in suspension and part in solution. As will be presently pointed out, this is an important finding, for it indicates that we may not be dealing with either caffeine or tannin in the free state in tea at all. At all events, we have never found in teas classed as common or indifferent caffeine and tannin dissociated from each other. The foregoing simple experiment suggests, therefore, that the quality of a tea may rest on the question as to whether its constituents are balanced.

The Estimation of Caffeine Tannate in Tea.

Considerable difficulty was found in hitting off an analytical method which would successfully separate the whole of the caffeine tannate of the

tea infusion as such, so that it could be submitted to independent examination; but after some months' experiments a method was obtained which gave very instructive results. It consisted shortly in saturating the infusion with ammonium sulphate, which completely separates the caffeine tannate, which may then be dissolved in absolute alcohol, the alcohol evaporated to dryness, the residue weighed and further examined as to the proportions of caffeine and tannin it contained. (Free tannin itself is soluble in a saturated solution of ammonium sulphate.) In table A we give the results obtained with various teas when examined by this method.

TABLE A.—*The proportion of Caffeine Tannate in various Tea Infusions and the Composition of the Tannate.*

Description of tea.	Caffeine tannate or ammonium sulphate precipitate after dissolving in alcohol.	Caffeine found in precipitate.	Tannin found in precipitate	Approximate ratio of caffeine to tannin in precipitate.
	%	%	%	
China ...	6·00	1·44	4.56	1 to 3
China ...	6·80	1·72	5.08	,,
Indian ...	6·52	1·64	4.88	,,
Ceylon ...	4·48	1·12	3.36	,,
Indian ...	10·20	2·60	7.60	,,

It would appear from this table that in tea we are dealing with a definite compound of caffeine and tannin, for although different types of teas were examined, yet the same caffeine-tanin compound was obtained, showing always a constant ratio (I to 3) of caffeine to tannin. Caffeine tannate is thus probably a definite body, but it does not follow that the whole of the tannin or of the caffeine present in tea infusion is necessarily obtained with one are the other, as the case may be. Part certainly is, and in some cases, as will presently be shown, the whole of the caffeine and tannin is united.

Caffeine Tannate Prepared in the Laboratory.

The next step indicated was to prepare caffeine tannate in the laboratory, and to estimate the proportion of the two constituents in the compound. This was done, and the results gave support to the idea that caffeine and tannin form a definite compound containing 1 part by weight of the former, combined with 3 parts by weight of the latter.

Solutions respectively of caffeine and tannin were prepared, each containing 1 per cent. of the pure substance. It is obvious that if one part of caffeine combines with 3 parts of tannin to form a compound, I volume of the above caffeine solution when added to three volumes of the tannin solution should give this compound with neither caffeine nor tannin in excess. A better test, however, would be in the one case to add an excess of caffeine in the mixture, and in the other an excess of tannin, and determine in each case what the excess of free substance was. The first experiment consisted in adding 3 cubic centimetres of a 1 per cent. solution of caffeine to 30 cubic centimetres of tannin solution (1 per cent). A milky fluid resulted which cleared up on heating; it was evaporated to dryness on an inert distributing surface, kieselguhr, and the residue was extracted with ethyl acetate. The ethyl acetate extracted 0·210 gramme of tannin out of 0·30 gramme added, leaving a difference of 0·09 tannin combined with the caffeine. The caffeine added was 0·30 (3 cubic centimetres of a 1 per cent. solution). Thus there was formed a residue containing 1 of caffeine to 3 of tannin. In another experiment it was found that 30 cubic centimetres of tannin solution (1 per cent.) required exactly 19·2 cubic centimetres of N/10 caustic soda to neutralist it, using phenol-phthalein as indicator. When, however, 3 cubic centimetres of a 1 per cent. solution of

caffeine was added, the mixture required 14·4 cubic centimetres of N/10 caustic soda for neutralisation. The difference, 4·8 cubic centimetres, represents the amount of tannin which had combined with the 3 cubic centimetres of caffeine solution added (—0·03). By calculation it was found that 4·8 cubic centimetres of N/10 caustic soda represent 9 cubic centimetres of the tannin (1 per cent.) solution (—0·09), and that, therefore, again, caffeine had combined with taunin in the proportion of 1 of caffeine to 3 of tannin. This experiment was several times repeated with in each case the same result. Moreover, in some experiments the prepared caffeine tannate was split up by lead oxide and the caffeine separated ane weighed. The tannin was estimated by adding dilute sulphuric acid to the lead residue and extracting ethyl acetate, or determining the tannin after adding an excess of bicarbonate of soda direct by means of a standard iodine solution. Again 1 part of caffeine was found combined with 3 parts of tannin.

Caffeine has a very remarkable affinity for tannin, since in one experiment we found that it will combine with the tannin of leather and reduce it to the soft pulpy condition of untanned hide again, caffeine tannate being found in the solution.

VARIATION IN THE AMOUNT OF CAFFEINE TANNATE IN TEA.

The next question calling for investigation was, to what extent was the caffeine in tea infusion combined with tannin, or the tannin combined with caffeine? As subsequent experiment proved in many teas (curiously enough all those regarded by tea experts as of good quality), it was found that the *total* caffeine and *total* tannin occurred in the ratio of 1 to 3. In many others there was not this balance, caffeine in some cases being in excess, while in others tannin predominated. The conclusion is irresistible that the physiologically best teas are those in which the total caffeine and total tannin occur in the ratio of 1 to 3—in which, in fact, the caffeine is completely neutralised by the tannin or the tannin by the caffeine, and that therefore they are present as caffeine tannate, and neither in the free state.

Since the above results were obtained we have seen a report, issued from the Imperial Institute, in which the analyses of various teas grown in British Central Africa are given. The following are the results in regard to caffeine and tannin :—

		Caffeine.		Tannin.
Tea No. 1	...	3·68	...	10·50
,, No. 2	...	3·35	...	9·50
,, No. 3	...	3·08	...	10·30
,, No. 4	...	3·54	...	10·40
,, No, 5	...	3·19	...	10·60
,, No. 6	...	3·22	...	9·80

It is remarked that "these results show that the samples of tea are of good quality," and in many instances it will be noted that the ratio of caffeine to tannin is very close to 1 to 3.

THE PHYSIOLOGICAL IMPORTANCE OF A CHEMICALLY BALANCED TEA AND THE VIEWS OF THE TEA-TASTER.

Tannin may, therefore, prove after all a blessing in tea, inasmuch as it keeps the assimilation by the human organism of the heart stimulant, caffeine, under control. Similarly, when the constituents are balanced, caffeine may be expected to negative entirely the astringent action of the tannin. On the other hand, an excess of either constituent is clearly to be avoided, as each would then be free to exert its own specific action. The points raised by these considerations are clearly of the utmost physiological importance, and we hope to discuss them more fully later. In the meantime, if it comes to be proved that the best teas, physiologically speaking, are those

in which the caffeine and tannin are chemically balanced, that they occur completely absorbed by one another as caffeine tannate in which 1 of caffeine is combined with 3 of tannin, it will be interesting to see how far this view agrees with the judgment of the expert taster. Has what he regards as quality in a tea, and therefore a tea entitled to a high price, anything to do with the balance of caffeine and tannin, to which attention has been drawn? It is quite clear that caffeine tannate possesses neither the astringent taste of free tannin nor the bitter flavour of free caffeine. Caffeine and tannin serve, not merely as antidotes to each other on the score of taste, but most probably on more important scores also. Tannin is, for example, a well known antidote to most of the poisonous alkaloids, and caffeine might be reckoned as one of these. It is a remarkable fact that hitherto the results of the chemical analyses of teas have led to nothing in common between the chemist and the taster. Quality in tea so far has been beyond the reach of the analyst to adjudicate upon. He has said what the amounts of caffeine and tannin are, but these mere statements have thrown no light upon the aesthetic and commercial value and quality of the tea submitted to examination. Distinct hope, however, may come from the theory of balance applied to the caffeine and theine in tea which we have put forward. At all events, there are some interesting points of agreement between the expert tea-taster's view and his theory. In Table B will be found a number of analyses of teas which before they were submitted to analyses were each described by the expert taster in terms regarding their aesthetic quality and commercial value. We may say, at the outset, that in by far the majority of instances we were able to show subsequently that his view of the quality of the tea proved to be based upon the question whether or not that tea contained its tannin and caffeine in balanced quantities. Whenever the tea showed a preponderance either of tannin or caffeine over and above that required by the combination of caffeine I and tennin 3, his verdict was invariably " a common tea" or " an indifferent tea." When, on the other hand, there was neither caffeine nor tannin present in quantity exceeding what the compound of them contains (caffeine tannate), then the tea was pronounced as of good quality. In other words, the expert, by his palate and other considerations, says, in effect, the caffeine and tannin in such and such a tea are not balanced, therefore it is not a fine tea, or the caffeine and tannin are present in a combined state and therefore the tea is bland, smooth, and a good one. In the case of an inferior tea he probably tastes either free caffeine which is bitter, or free tannin, which is astringent, and promptly calls the tea unsuitable. In the case of the fine tea he tastes neither, bnt a combination of them, which is neither astringent nor bitter. When contrasting chemical results with the skill of the taster a complete concordance can hardly be expected, but Table B shows broadly that the palate of the taster is largely influenced by the chemistry of the tea submitted to his judgment. To go back to the old analogy, common salt has a neutral smooth saline taste, but if either of its constituents is in excess the taste would be repulsive—*viz.*, that of caustic alkali on the one hand, or of a corrosive acid on the other.

On consulting Table B [in next issue] it will be found that, generally speaking, the common (and cheap) teas contain an excess of caffeine over tannin present, but the good teas (high-priced) invariably contain an excess neither of caffeine nor of tannin, these being present in complete combination in the form of caffeine tannate. It is possible that by a careful system of blending these excesses could be to some extent avoided, but we must defer for a later stage the consideration of blending.

(*To be continued.*)

SELECTED CUTTINGS.

When Should Manure be Applied in India.

[*Concluded.*]

Another suitable example is the black cotton soil area in the Berars taking Akola as a specific point. The land is "black cotton" soil and this (usually) will usually hold a fairly large *maximum* amount of water. The rainfall of this part is only small, *viz.*, about 30 inches and this is distributed very uniformly over June, July, August and September; usually less than one inch falls in any of the other eight months of the year. Clearly then we may say it is useless to put a soluble manure on the land as a top-dressing during the "cold weather." If used for the *rabi* it would be necessary to plough it in before sowing. For the "rains" crops it is probable that it would be unsafe to put it on the land before sowing. It is true that when rain comes at the end of the hot weather the land will be so dry that the five or six inches of rain will be absorbed mostly by the upper floor of soil, but black cotton soil cracks so much that some portion of any heavy rain runs directly into the subsoil, and whilst an exaggerated idea exists regarding manures being washed away by rain, still in the case under consideration there would be a risk of some loss. On the other hand if a soluble manure were scattered on the land after the crop had grow six inches or so high, the current rainfall of July should wash it into the soil; the hot weather cracks will be closed up by this time, and the usual rainfall would not be sufficient to carry the fertiliser out of the area in which the root development is taking place. Even a fall of two inches of rain at one time would do no harm in this respect, though one of four inches in one day might do so.

On the other hand, the same assurance could not be given for the neighbourhood of Nagpur where the soil is also "Regur." Appended are the rainfall data for the latter half of June and the month of July, and judging from this it seems likely that in six out of the nine years top-dressing saltpetre would have been largely lost to the crop.

Years.	June 15th to 30th	July. 1st to 15th	July. 16th to 31st.
1906	17·37	4·79	9·85
1905	5·1	9·79	2·50
1904	6·3	3·90	0·57
1903	5·62	7·25	17·52
1902	0·10	8·36	2·28
1901	4·84	1·04	6·92
1900	2·74	7·61	7·84
1899	4·00	1·68	1·56
1898	3·00	6·54	12·99

So far then as these very soluble fertilisers are concerned it is purely a question of probable rainfall together with a consideration of the maximum amount of water the particular soil will hold.

I have been asked two questions in relation to possible loss of soluble fertilisers. The first is, supposing after *top-dressing* with say saltpetre, a heavy fall of rain commences, such as ·2" in the first hour, would any of the fertilisers be washed off the land ? It is easy to show that it would not. We may take the following figures by way of illustration. Assume that the the top dressing has consisted of 500 lbs. of saltpetre per acre. This is a much larger amount than one can usually afford to put on for a crop but an extreme figure is purposely taken. Previous to this rainfall it is to be assumed that no rain has fallen for at least some days; otherwise the "top-

dressing" would hardly have been put on. Since a crop transpires very large amounts of water, it is clear that the surface soil cannot be saturated; hence it is equally certain that the first rain will soak into the land; it will be sufficient to assume that the first ·2" is thus absorbed before any water commences to run off the surface drainage. Now 500 lbs. per acre is equal to ·18 oz. per sq. ft.; ·2" of water=16 oz. per sq. ft., and since the 18 ounces of saltpetre would readily dissolve in $\frac{3}{4}$ oz of water, it is clear that the first ·2" of rain (16 oz. per sq. ft.) is far more than is required to dissolve up the fertiliser; this water is indeed sufficient to carry the solution at least $\frac{1}{2}$" below the surface. If it is further recognised that there must be a downward movement of water taking place in the surface soil throughout the duration of the rainfall we are considering, it is clear that the nitrate having once entered the soil, it is perfectly protected from removal in any of the rain which may subsequently run off the field.

The second question which my friend put is in relation to "diffusion." I am not sure that the general reader of this journal will understand what this process is, but he may readily make an experiment which will demonstrate it to himself. Take a small teaspoonful of sugar in a glass tumbler and add ten teaspoonfuls of water. If the sugar and water are stirred together, the former will gradually disappear and *dissolve* in the water. We shall then have a solution of sugar. Now pour on to the top of this solution some clean pure water until the tumbler is nearly full. The water must be poured down the side of the tumbler very slowly and carefully so that it does not mix with the sugar solution any more than can be avoided. Now place the tumbler on a shelf where it cannot be disturbed. At first the sugar solution will appear quite distinct from the water above it, but gradually in a few days it will be seen that the one liquid merges into the other and that the water in the upper part of the tumbler will become sweet. Thus the sugar has passed without any shaking or stirring from the one water into the other. The process is called "diffusion" and it occurs whenever a solution of a substance is brought into contact with some more of the same solvent.

Now the question which was put to me in relation to the possible removable of soluble manure, was this. Assume that the saltpetre is ploughed into the land before sowing, and that subsequently moderate through not excessive rain occurs, sufficient to carry the salt from the top 4 " of ploughed soil more or less into the first 12". We would now have a solution of saltpetre in the first foot, but in the second and succeeding feet we should have either less or no saltpetre (there would probably be some saltpetre in the subsoil independently of that ploughed in). Diffusion would now naturally set in, and occasion some of the saltpetre to pass into the subsoil. My friend's question then is, would this process of diffusion be likely to occasion the removal of so mnch of the saltpetre from the surface soil to the subsoil and hence from the area in which the growing plant is developing as to seriously rob it? The information on the subject of diffusion of salts in soils is very limited, but it is a very much slower process than in plain liquids and I shall be safe in saying that not one-tenth part of the saltpetre could be thus lost to the plant.

Passing from these very soluble fertilisers to the insoluble ones such as finely ground bone, mineral phosphate, basic slag, it is clear that since they are so little soluble in water, they cannot be washed into the soil like sulphate of ammonia or saltpetre by heavy rainfall. The chief point to bear in mind in their use is that they should be as intimately mixed into the soil as possible. Accordingly it is an advantage to broadcast these fertilisers on the land at the commencement of tillage operations and give than every

chance, by the repeated ploughings and cultivations that precede sowing, of becoming throughly incorporated into the soil.

Superphosphate, in so far as it is affected by rainfall, stands on much the same footing as insoluble fertilisers. Its chief constituents, the soluble phosphate of lime, is, as a matter of fact, perfectly soluble in water, but no sooner does a solution of this substance come in contact with the lime and iron in the soil, than it is rendered again insoluble and it is caught, so to speak, by the aoil. Were it not for one factor it would be best to deal with it like the bone meal or basic slag, and bring it into as perfect intermixture with the soil by tillage operations as possible. But it is expensive, especially in India at present, and on this account a distinct advantage would lie in "drilling" it into the land immediately in front of the seed. It would then be carried by rain into just those parts of the soil where the young plant developes. Of course in many parts of India seed is not drilled but only broadcasted, and in such parts superphosphate also cannot be drilled.

The third great class of fertilisers are the bulky manures. There can be no object in making suggestions to practical men about the application of these. It is known from experience that they must be mixed into the surface soil some little time before sowing the seed where they become gradually changed into substances which the plant can assimilate. It may be of interest to some readers of this Journal to know that one part of such fertilisers is changed into the very soluble nitrate which we dealt with previously, and this can of course be carried away by drainage water. On the other hand, this nitrate is formed *gradually* and hence if a heavy rainfall occurs falls shortly after ploughing in farm manure or a green crop, only that part of the nitrate which has already formed can be removed ; a further part will be formed later on as the season progresses and some no inconsiderable part is reserved in the soil for future years.

The China Tea Trade.

Mr. J. W. Titoff, Manager of the Trading Co., has received from the Company's Hankow branch information with regard to important proposals by the Chinese Government to encourage the China tea trade.

The information takes the form of an extract from the Chinese newspaper *Gun Sin Lun Sin Bao*, dated 27th February, which is evidently considered authoritative. It states that the Chinese Minister of Trade has proposed the following project *re* the tea business during 1911 :—(1) To send special Government officials to all tea-growing districts to give full details about the condition of the tea trade ; (2) to stop the importation into China of any foreign grown teas ; (3) to lower the export duty on Chinese tea, and possibly to increase the duty on imported tea.

The proposals have not yet been passed, but are under the consideration of the Government. All the Russian firms have protested against these suggested steps through the Russian Ambassador. Another suggestion is to create a monoply for Chinese merchants to deal in China teas.

Mr. Titoff says if these proposals are carried out it will have a serious effect on trade ; but he does not think the most drastic of the suggestions will be adopted.—*Times of Ceylon.*

A School of Instruction in the Art of Growing and Picking Tea, has been opened at Nanking by the Viceroy of the Liang Kwang. It has accommodation for 120 students, but the Board of Agriculture, Industry and Commerce (the Nunkungshang) has ordered the Viceroy to increase this, and make every effort generally to improve the trade. The course at the school will be one of three years.—*Straits Times*, February 24.

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Government Paper of the face value of Rs.3,000 has been purchased on behalf of this Fund. Total holdings of 3½% Government paper now amount to Rs.10,000.

International Rubber Exhibition.

In connection with the International Rubber and Allied Trades Exhibition to be held at Olympia from the 24th of June to 11th of July 1911, the Manager has sent out a batch of papers with a request that the information they contain shall be made known to planters. Although some of the information is in the nature of advertisement, it seems desirable that publication should be given to it as desired.

SEASON TICKETS.

No. 1. 7/6 not transferable—including admission to the Opening Ceremony 24th June, and entitling the Owner to Membership of the Exhibition Rubber Club.

No. 2. 5/1 not transferable—admitting after 3 P.M. on the Opening Day, 24th June, and at all times from 11 A.M. to 10 P.M. until 11th July, but does not entitle the owner to admission to the Opening Ceremony nor to the Exhibition Rubber Club.

These Season Tickets can only be obtained at the above named rates up to the 31st May, 1911. After that date they will be 10/6 and 7/6 respectively.

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HOTELS.	TERMS.	MEANS OF REACHING THE RUBBER EXHIBITION.
Kingsley Hotel, Hart Street, Bloomsbury Sq. (nr. the British Museum).	Bedroom, Attendance, and Table d'Hôte Breakfast, from 5/6 to 8/-. Bed, Breakfast, Attendance and Dinner 8/6 to 10/6 per day. Full Board and Attendance 11/- to 13/- per day, according to position of rooms. *Note*—(Coronation Week Terms from 19th to 23rd June, £3, for the four days, then rates as given above.)	A few minutes walk from Theobalds Rd. Electric Tram direct to the Rubber Exhibition.
Thackeray Hotel, Great Russell St., (Opposite the British) Museum). Telegrams, "Thackeray, London."	Terms as above, this Hotel is under the same management.	As above.
West Central Hotel, Southampton Row, W. C. Telegraphic address "Quietude, London."	Bed and Breakfast from 5/- according to floor. Table d'Hôte Lunch 2/- and Dinner 3/- The above includes attendance and is the rate charged daily throughout the stay.	Electric Tram from Theobalds Rd. (by the Hotel) to the door of the Exhition, or Motor Bus.

Cosmo Hotel, Southampton Row, Russell Sq., W. C. Telegraphic address "Telcosmo, London."	Bed, Table d'Hôte Breakfast and Attendance from 5s. Lunch 2s. Dinner 3/- Full Board 9/- or 2½ guineas per week, from 19th to 25th June 3½ guineas. The above terms are quoted for a stay of not less than one month.	As above.
Bonnington Hotel, 92, Southampton Row, W. C. Telegram, "Excursions, London."	Room, attendance, Breakfast and Bath 5/- do. and Dinner 7/6 do. Full Board 9/-. *Note*—The above terms will be charged before and after the Coronation, but for the Coronation week a fee of FR. R. P. per each person for Full Board will be charged.	Electric Tram from Theobalds Rd. (by the Hotel) to the door of the Exhibition or Motor Bus.
Howard Hotel, Norfolk St., Victoria Embankment. Telegraphic address, "Kiconi, London." This Hotel is just off the Strand, & near the Law Courts.	Bed and Breakfast from 9/- to 8/6 per day, according to floor. Full board including attendance, from 10/6 to 12/6.	Electric Tram from the Embankment or Kingsway Stations or tube from the Strand to King's Cross thence by tube to the Angel or Motor Bus from the Strand or the "Favourite" Horse Bus to the door of the Exhibition.
Private Residential Home, 12, Westbourne Crescent, Hyde Park, W. (nr. Lancaster Gate Tube & Praed St.).	Terms are per week 34/- £2-2-0, £2-10-0 and £3-3-0, according to Room including Full Board, Attendance, Bath and Lighting.	District Railway from Praed St. to King's Cross thence by Electric tram to the door of the Exhibition or tube to Chancery Lane then by Electric Tram from Gray's Inn Rd, to the door of the Exhibition.

MADRAS GOVERNMENT'S CONTRIBUTION.

The Rs.3,000 granted by the Government of Madras towards the expenses of the U. P. A. S. I. in connection with the Exhibition has been collected.

EXHIBITS.

Planters are requested to kindly note that all Exhibits should be forwarded *direct to Messrs. Peirce, Leslie & Co., Ld., Calicut.*

DISTRICT PLANTERS' ASSOCIATIONS.

Shevaroy Planters' Association.

The Proceedings of a Quarterly General Meeting of the Shevaroy Planters' Association held in the Victoria Rooms, Yercaud, at 1-30 p.m., on Wednesday, 15th March, 1911.

PRESENT:—Messrs. E. Dickins, C. G. Lechler, J. C. Large, Revd. Rochet, C. Rahm, L. E. T. Short, and Ch. Dickins (Hon. Secretary and Chairman).

(1). The notice calling the meeting was taken as read.

(2) (*a*). Resignation of Mr. G. Turner. Read letter dated 23/2/11 from Mr. G. Turner resigning the Association.—Accepted with regret.

(*b*). Resignation of Mr. R. Gompertz. Read ietter dated 7/3/11 from Mr. Gompertz resigning the Association. Resolved—As Mr. Gompertz has presumably no further interest in planting on these Hills, this meeting accepts his resignation with much regret. At the same time on behalf of the S. P. A. this meeting takes this opportunity of thanking Mr. Gompertz for the very valuable direction and help he has shown to this Association for a number of years past, not only as its Chairman and Honorary Secretary, but also as a Member of Committee. —Carried unanimously.

(3). *Scientific Department.*—With reference to circular letter No. 51/10 of 24th October 1910 from Secretary, U. P. A. S. I. Resolved that—As the response to the Hon. Secretary's open letter is contrary to the levy of a tax of 6 as. per cultivated area, this meeting suggests that the matter be postponed.—Carried unanimously.

(4). *Attestation of Cooly Agreements.*—Read letter dated 11—2—11 from Mr. A. G. Nicholson with reference to attestation of cooly agreements by Village officials. Resolved that the Hon. Secretary be requested to wrtei to the Collector and District Magistrate, Salem, asking if he would vedy kindly issue orders to Village officials to attest such agreements.—Carrierd unanimously.

(5). *International Rubber Exhibition.*—Read and recorded with much satisfaction circular letter No. 20/11 dated 8th March from Secretary, U. P. A. S. I.

(6). *Papers on the Table.*—Report of Agricultural Department and various Tea circulars.

(Signed) CH. DICKINS,
Hon. Secretary, S. P. A.

The Acting Governor of Southern Nigeria, in his report, says:—"Attempts to improve the quality of the rubber exported from Southern Nigeria have been rendered futile, owing, principally, to the unwillingness of the merchants to pay for the inspection and supervision of the rubber tappers and to the reluctance of the Government to follow the lead of neighbouring Governments and prohibit the sale or export of lump rubber. The receipts for rubber licenses during 1909 amounted to £1,947-10*s*. During the year 1,388,009 lb. of rubber was produced, the value being £109,078."

INDIAN TEA CESS COMMITTEE.

Extract from Proceedings of the Half-yearly Meeting of the Indian Tea Cess Committee held at Calcutta, the 17th February, 1911..

PRESENT.—Mr. G. Kingsley. (*Chairman presiding*), Mr. T. McMorran, (*Vice-Chairman*), A. D. Jackson, Hon'ble Mr. W. T. Cathcart, Mr. C. D. Inglis, Hon'ble Mr. W. Skinner, Mr. R. R. Toynbee, Hon'ble Mr. A. W. C. Chaplain, Mr. P. Balmer Lawrie, Hon'ble Mr. R. H. Henderson, C.I.E., Mr. Claud Bald, and Mr. S. G. Anderson.

The Secretary having read the notice convening the meeting,

The Chairman said that he had to present the revised estimate for the year ending 31st March 1911, and the first estimate for the year ending 31st March 1912. The business before the meeting was to make the various allotments of funds for the work which their agents were doing in different parts of the world. It would be, he thought, convenient if they departed from the order in which the items of business were placed on the agenda, and dealt first with No. 7, the Green Tea bonus. He made this proposal to them, because if they decided to allocate a sum of money for the bonus, it might be necessary slightly to modify some of the other allotments. He asked Mr. Jackson, who had come from Madras to represent the South Indian tea industry, to state the case for the renewal of the bonus.

GREEN TEA BONUS,

Mr. A. D. Jackson said:—Mr. Chairman and Gentlemen.—I confess that I feel at a disadvantage in attempting to address you on the subject of the revival of the Green Tea bonus. The fact is that, up to almost the last moment, I have cherished the hope that I should have a planter colleague with me to do all the talking, and that I should be able to fill the agreeably easy position of onlooker and merely echo his sentiments. Consequently, though I have studied the papers on the subject and have formed my own opinions, I have done very little indeed in the way of arranging arguments with which to commend them to you. It is, I regret to say, some time since I had the pleasure of sharing in your deliberations, but on the last occasion my friend Mr. Acworth and I had a mandate in connection with the exploitation of tea in India. We were so fortunate then as to enlist the eloquence of Mr. Grey, and I should be happy if I felt assured that some of you gentlemen will now support me with similar eloquence. It is a matter of special regret to me that Mr. George Romilly was not able to come with me and I know that he was equally disappointed, but Mr. Romilly is on the eve of retiring from India and he could not manage to come to Calcutta so near the date of his departure. He has, however, done the next best thing, for he has very kindly provided me with his views on paper, and, with your permission, I will read to you what he writes :—

"I regret that I am unable to attend the meeting in person. As I am "sorry to hear that the United Planters' Association of Southern India have "been unable to get another representative to advocate their views, I venture "to put them before you in writing. A Colombo firm, as I believe you are "aware, is starting a finishing factory at Quilon for the preparation of green "teas for the market. It is generally felt by planters in the South of India "that there is a great promise before a green tea industry if only enough "planters can be induced to alter their methods of tea-making and to start "the making of greens. A bonus on the manufacture for a year or two "would just give the necessary stimulus and in all probability it would not "be required for more than two years, as planters would by then realize that "they have got a very lucrative industry. I understand that the chief "reason why the bonus was not persisted in formerly, was because there

"was no continuous supply of greens and that when repeat-orders came "they could not be executed. In consequence no permanent market was "established and the money spent on the bonus was wasted. The object "of the Cess money is to foster the industry in India and to expand the "market abroad, and very well has that object been carried out as a rule, "but in the matter of green tea it failed. But I think that a great opportu- "nity will be wasted if the present chance is not seized, because it will give "us a new market for green teas on a different basis in the United States "of America which we failed before to establish. The advantage which the "South of India has over the North, in the matter of greens, is that the "supply of leaf is continuous throughout the year. There is no cold weather "break, and we make tea during every month. Also the quality is very "uniform. A former drawback to the establishment of a real market was "that no dependence could be placed on the uniform appearance of the teas "manufactured. With a continuous supply of leaf and one finishing factory "working on a large scale, this drawback will be removed. The American "market can be studied and teas made which suit the demand instead of "making a tea, as was done formerly, for which it was hoped to create a "demand. Ceylon, which resembles Southern India in its climatic conditions "to a very great extent, has succeeded in establishing quite a large market for "its green teas in the United States of America. Mr. Blechynden, our Agent "in the United States of America, has talked the matter over with Mr. C. "Gill, of Messrs. Harrisons and Crosfield, and has assured him that, in his "opinion, part of the Cess fund could not be better utilised than in pushing "the scale of green tea in the States. At the present moment his energies "are restricted to black tea, but there is a very large demand for green tea "as you are doubtless aware and Mr. Blechynden, if he was sure of con- "stant supplies, could work the two lines without any great additional "trouble and expense. I suppose that I need not go into the statistics of "the trade and consumption of green tea in the States, which, as you know, "comes chiefly from Japan and China. Ceylon has already captured a "small portion of this demand for her green teas, and there is no reason "whatever why India should not do the same if she is in a position to send "a constant supply. Mr. Blechynden has, I think, in his reports, told you "this himself.

"To sum up the situation, you have a large market open to you. if you "will make up your minds to attack it; you have a new source of supply "ready to be devoloped, but the pioneers of which require a little encourage- "ment at outset. The bonus on the manufacture for a couple of years is "all that is required. It is not reviving an experiment which failed "but starting a quite new industry, for in the former period of bonus- "giving, South India, the one district admirably suited for the production of "green teas, was not sufficiently developed as a tea-producing area to avail "itself of the chance. It is now estimated that three or four million lbs. of "green tea would be produced at once, which in itself relieves the black tea "market considerably. It may be argued that the present is not a particu- "larly good time for the start of green teas, because the market for common "blacks is so high, but that we may be sure is only a temporary condition "of affairs. The outlet in greens will always be kept open as it is sure to be "found remunerative, so the advantage to black tea makers and to the "industry generally will be permanent. It may also be argued that in all pro- "bability the manufacture of greens will be undertaken without the offer of a "bonus, but that I think is hardly a fair argument to bring forward. If "individual planters and firms have the courage to be pioneers of an industry "which will help the whole community considerably, but which very possi-

"bly will not be remunerative until the market has been studied and the "desired kind of tea produced, assistance ought to be given to them from the "Tea Cess funds. I think that this is essentially a case in which help ought "to be given and I can only trust that you will see it in the same light. I "regret that I cannot urge the matter on you personally, but I have discussed "it with Mr. A. D. Jackson, who thoroughly understands the views taken by "the planters of South India, and feel that I can leave the matter in his "hands with confidence."

As I understand the position, there is at present a unique opportunity to found in America, a large and permanent business in natural green teas, and as to this we have the evidence of our own Commissioner. I have a letter here from Mr. George Gill, of Messrs. Harrisons and Crosfield, to Mr. Romilly, which I feel I ought to read, though I must apologise for taking up so much of your time.

[The letter was read, but need not be published here.]

I may add that I am authorised to say that in answer to a direct question to Mr. Blechynden if he could suggest a better or more effective way in which part of the Cess fund could be utilized for the benefit of the Indian tea industry as a whole than by paying a bonus on green tea manufactured, he admitted that he could not. There appears to be a feeling, at any rate amongst some of the members of the Indian Tea Association, that because a certain firm is prepared to go ahead with a green tea campaign, bonus or no bonus, therefore assistance is unnecessary. I agree with Mr. Romilly that it is hardly a fair argument or one which should weigh with us, and to my mind it savours of the mistake of "spoiling the ship for a ha'p'orth of tar." Now as to ways and means, I see that you have budgeted for £4,000 for promoting the consumption of tea in India and £21,000 for promoting the sale in other countries. Now in view of Mr. Blechynden's opinion, which I have quoted, I would urge that up to half the amount required for the green tea bonus it should be reserved out of the £10,000 allotted to America, the balance required being secured by *pro rata* reductions in the other allotments, unless you decide to eliminate "Tea in India" altogether, as to work in which direction I for one am not sanguine of commensurate success. However, if you agree, as I hope you will, that the present opportunity to push India green tea in America is one which should not be neglected, and that neglect of it is likely to be deeply regretted, then I have no doubt that we shall be able to find the money, and that without seriously hampering our work in other directions. It would indeed be remarkable if South India, which so far as my knowledge goes has hitherto been generously treated, should in this instance have something less than fair treatment meted out to her planters.

I have referred to the last occasion when I was present at the Annual Meeting, and you were good enough then to vote a matter of Rs.20,000 for the purpose of encouraging the sale of tea in the cup. I do not wish to pursue the parallel, as I am bound to confess that the experiment was not worth the money, but I feel that the present proposal which I have tried to support is a sound proposition and that it should commend itself to you. I am, therefore, confident that the mission with which I have been charged by the United Planters' Association of Southern India will not be unsuccessful.

The Vice-Chairman (Mr. McMorran) asked if it was the intention of the United Planters' Association that the bonus should apply to green tea manufactured in any part of India, or only in Southern India.

Mr. Jackson replied that the intention was that tea manufactured in any part of India should be eligible for the bonus.

The Vice-Chairman said that he made the enquiry, because there was already a certain quantity of green tea manufactured in Northern India. The manufacture was carried on in the Surma Valley, and also in the Punjab. No bonus was being given, and presumably the producers of the tea found the trade sufficiently profitable without a bonus. That being the case, he experienced difficulty in understanding how the Cess Committee could accede to the request made by Mr. Jackson. For to do so, would mean that, so far as Northern India was concerned, they would be giving a bonus on tea which would be manufactured without it.

Mr. Jackson said that the United Planters' Association did not care to propose that the Cess Committee should differentiate between tea manufactured in Southern India and tea manufactured in Northern India. And for himself he thought that it was rather doubtful if the Committee would be willing to differentiate. In reply to an enquiry from the Chairman, he said that the idea was that the bonus should be promised for two years. But this would not be a condition, as he understood that the procedure of the Committee did not admit of a grant being made for a longer period than one year.

Mr. Toynbee enquired as to the effect on the proposal of the new regulation in the United States regarding coloured green teas.

Mr. Jackson replied that the regulation in question was, so to speak, one of the foundations of the proposal. The tea which would be manufactured in South India would be unfaced natural green tea. Teas of this class would be freely admitted into the United States, while coloured green teas would be handicapped. The present was, therefore, as Mr. Blechynden had pointed out, a unique opportunity for the introduction of Indian natural green teas.

The Vice-Chairman remarked that, to him, the opportunity seemed to be good enough on its own merits, entirely apart from the bonus.

Mr. Jackson said that some people were of that opinion; and he believed that the South India scheme would go on in any case. But the point which he wished to urge was that the grant of the bonus would make it an absolutely certain opportunity. On the other hand, the withholding of the bonus might perhaps be just sufficient to spoil it; and to miss an opportunity of that description would be a matter for great regret in the future.

In the course of further discussion, the Chairman said that it was not easy to see how the difficulty in regard to Northern India could be satisfactorily overcome. Green tea, to the extent of three or four million pounds, was being manufactured in Northern India without a bonus, and notwithstanding the high prices ruling for black tea. That manufacture would go on irrespective of the bonus, and there was nothing to be gained, so far as he could see, by offering a bonus for it. The modification of the law in the United States would tend considerably to lessen the cost of the manufacture of green tea, as it would obviate the need for the most costly part of the machinery. Gardens taking up the manufacture now would be, therefore, in a much better position than those gardens which first undertook it.

Mr. Jackson then moved :—

> "That a bonus of six pies per lb. be offered on four million lbs. of green tea to be manufactured and exported from India."

The resolution was not seconded, but the Chairman took the sense of the meeting upon it, with the result that it received no support, except from the proposer.

TEA.

The Chemistry, Physiology, and Aesthetics of a Cup of Tea.

ULTIMATE *v.* PROXIMATE ANALYSIS OF TEA INFUSION.

[*Concluded.*]

It is interesting to observe also that proteins increase with the quality of the teas, and as proteins form an insoluble compound with tannin the

TABLE B.

The Analysis of Teas, with Special Reference to Caffeine Tannate.

Description of Tea.	Prices per lb.	Caffeine tannate.	Tannin combined with caffeine.	Caffeine combined with tannin.	Total tannin.	Total caffeine.	Caffeine not combined with tannin.	Tannin not combined with caffeine.	Extract.	Alkalinity of ash as K20.	Protein.
China (common)		3·60	2·70	0·90	3·78	2·40	1·50	1·08	22·00	0·96	...
,, ,,	Used in blends from 10d. to 1/2 (retail).	3·60	2·70	0·90	3·61	2·12	1·22	0·91	21·20	1·92	0·20
Assam ,,		8·00	6·00	2·00	5·79	3·52	1·52	0·21	27·20	2·30	0·90
Ceylon ,,		6·32	4·60	1·58	4·60	2·52	0·94	None.	24·80	1·72	0·70
Assam ,,		6·60	4·95	1·65	5·88	3·20	1·55	0·93	30·00	1·34	1·00
,, ,,	Used in blends from 1/4 to 1/8 (retail).	5·80	4·35	1·45	4·62	2·56	1·11	0·27	22·00	1·34	...
,, (good)		7·88	5·91	1·97	5·88	2·77	0·80	None.	27·00	1·92	1·10
,, ,,		9·80	7·35	2·45	7·30	3·40	0·95	,,	32·00	1·53	1·00
Ceylon ,,		9·04	6·78	2·26	6·88	2·88	0·62	0·10	30·80	0·76	1·20
China ,,	Used in blends from 1/6 upwards (retail).	6·80	5·08	1·72	5·09	2·40	0·68	0·01	24·00	1·34	...
Assam ,,		10·20	7·65	2·55	7·60	3·32	0·77	None.	30·00	1·92	1·00
Ceylon ,,		10·12	7·59	2·53	7·56	2·60	0·07	,,	34·00	1·72	1·70
Assam ,,		15·36	11·53	3·84	11·82	4·00	0·16	0·29	35·20	1·92	1·70
,, ,,		10·40	7·80	2·60	7·56	3·00	0·40	None.	30·80	2·14	1·10
Indian ,,		9·60	7·20	2·40	7·14	3·20	0·80	,,	28·00	1·53	0·60
Green tea ...	2/8	5·60	4·20	1·40	8·82	2·68	1·28	4·62	30·00	2·11	...

The above percentage results are based on the use of 5 grammes of tea in 400 cubic centimetres boiling water, the infusion being poured off after five minutes.

evidence is thus strengthened in favour of no free active tannin being present in good tea-infusions. It is well-known also, that teas have to be adapted to the various characteristics of the waters of different neighbourhoods, and it is conceivable that the balance of caffeine and tannin may be disturbed by, for example, chalk, which would tend to combine with tannin and liberate free caffeine. Here, also, the art of blending possibly aims at securing the equilibrium of tannin and caffeine already pointed out, taking into consideration the effect of a hard or soft peaty water on the soluble constituents of the tea. In this connection it is interesting to record that the tea-taster has samples of the water of different localities sent to him, so that he can decide which tea gives the best result with it. There is only one instance in the Table (B) in which tannin is in serious excess, and that, curiously enough is green tea, and in addition there is present 1·28 per cent. of caffeine not combined with tannin. *Primâ facie* it is doubtful whether tannin is ever an injurious constituent of ordinary teas; it is much more likely that caffeine is the mischief-maker, especially when a considerable portion of that alkaloid does not occur combined with tannin, as is invariably the case with common cheap teas. It is questionable, too, whether the powerful are more injurious than the delicate teas so long as the caffeine and tannin are balanced quantities—are, so to speak, in physiological equilibrium. The danger of the rich tea (although of good quality) is taking an excess of it, which can, of course, be avoided by using it sparingly, and thereby effecting an important domestic economy. So many people seem to disregard the fact that the powerful teas should be employed in quantities consistent with their rich quality. In the above analyses many of the good teas present twice the physiological value of the common teas, although their price may be only 50 per cent. more, if as much. It is illogical, therefore, to adopt the tea-spoonful as the standard of measurement for all descriptions of teas; the dose might with advantage be reduced to a decidedly smaller quantity in the case of balanced teas which give a rich infusion. It is commonly asserted that when tea is infused for a long time there is much more tannin dissolved in proportion to the caffeine. That may be true for teas of common quality or cheap teas, but in one experiment we made it does not appear to hold good for a tea of good quality. A good Indian tea, for example, gave on 5 and 15 minutes infusing respectively the following results:—

	5 minutes (per cent.)	15 minutes (per cent.)
Caffeine tannate	10·40	10·68
Tannin combined with caffeine ...	7·80	8·73
Caffeine combined with tannin ...	2·60	2·68

It will be observed that more tannin was extracted but more caffeine was extracted also. In reality with a good tea more caffeine tannate and not tannin is extracted. The ratio 1 in 3 of caffeine to tannin, is, in fact, preserved in the 15 minutes' infusion. The suggestion of this is that it matters little whether a good tea be infused for a longer time, but, of course, a stronger liquor is obtained. This consideration hinges again on the question of blends, and at the present time we are engaged on further analytical work on the question with the view of ascertaining whether the blender unconsciously aims, after all, at producing the equilibrium of tannin and alkaloid to which we have referred. At the moment it is premature to regard the case which we have put to be absolutely proven, but the investigation so far has certainly brought to light an interesting set of facts based on chemical analysis which show a remarkable agreement with the views of the expert tea-taster. We should expect to find from these results, for example,

that when he regarded a tea as one of good quality, the caffeine and tannin would appear practically entirely in the form of a combination, caffeine tannate. In the case of a tea which he puts aside as common or indifferent we should expect to find that the caffeine present was not in affinity with the tannin. Possibly we are dealing with young tender leaves when the caffeine and tannin are found in equilibrium, and old or coarse leaves when it is not the case. This conclusion is interesting in view of the fact that tannin happens to be an antidote to alkaloids in general, and commonly forms with them substances which are at any rate insoluble in the stomach though they would be absorbed in the bowel. Is it not possible that the absorption of caffeine is less rapid when it is present with an equivalent of tannin, and that, therefore, the common teas which contain caffeine not in combination with tannin easily lead to theinism, caffeine poisoning? After all, caffeine is a powerful drug, increasing the strength and rapidity of the heart's action, and the blood pressure, and it is possible that its potency in this direction is favourably modified when it is exhibited with an exact equivalent of tannin, as in the case with teas passed by the expert as of good quality, "fine," and so, forth. Both constituents can behave badly physiologically when in the free state, but when in a mutual combination their vices are lost in the marriage and thetr virtues come uppermost. That seems to describe the case of a good tea. Tannin cannot "tan" in the presence of an equivalent of caffeine, and the poisonous qualities of caffeine are very probably diminished in intensity ween it exists entirely as tannate.

We reserve for future publication further researches on the subject which are proceeding.—*The Lancet.*

Commenting upon the above report in its editorial columns, "*The Lancet*" say:—" . . . . Until now chemical analysis of tea has been directed to a mere determination of the amount of caffeine and tannin present in the tea, without regard to the question of their probable existence in a state of combination. The work in our laboratory shows that a strong affinity exists between caffeine and tannin, and that probably the good tea, classed as such by the expert taster, is good because the caffeine and tannin occur together as a definite neutral compound, practically neither caffeine nor tannin being present in the free state. On the other hand, the cheap commoner classes of tea, according to the expert's category, did not in the experiments we record show evidence of this equilibrium being preserved between the two substances one or the other being in excess. In the common tea it appears probable that the bitterness of free caffeine is evident to the taster's palate, or the astringency of the free tannin, as the case may be. The good tea is classed as such because there is a definite balance of the two constituents, which, when present in certain proportions, which satisfy the requirements of chemical affinity, prove satisfactory to the palate. The probability is that this balance is also of physiological importance, since free caffeine is a poison and free tannin an astringent. Tannin is well known to form insoluble compounds with alkaloids, of which caffeine is one, and it is conceivable that in tea the tannin favourably modifies the effect of this alkaloid. Caffeine in its turn practically negatives the astringent action of the tannin; caffeine tannate, at any rate, is useless for the purposes of an astringent. It would, therefore, appear that when the taster decides upon the quality of a sample—(apart altogether from its flavour) he is guided largely by the fact that in a good tea the caffeine and tannin are present in proportions which mutually extinguish the bad qualities of each other and these bad qualities refer not only to taste but to a physiological effect."

RUBBER.

Rubber in Java and Sumatra.

AN INTERVIEW WITH MR. JOHN W. LINTNER.

Mr. John W. Lintner, of Messrs. Lintner and Co., Limited, is connected as a diroctor and adviser, with many important Rubber Companies having plantations in the Dutch East Indies, and has had considerable experience of the local conditions in the great islands. His view therefore on the position and future of rubber in Java and Sumatra, especially after his recent visit to that part of the East, cannot fail to have a peculiar interest for all connected with the industry in this country, especially for those who, whether as directors or shareholders, have relations with Java and Sumatra plantations. Mr. Lintner's time is valuable, but he kindly found a way of squeezing out an hour for our benefit, and we have now the pleasure of passing on his views to our readers.

In answer to our first question, which related to the present condition of Java rubber plantations, Mr. Lintner said :—

" The first fact that must be borne in mind when considering rubber in Java is that the greater part of Java has been cultivated for the past three hundred years, and that consequently we cannot expect the young trees to make as quick growth as in the virgin soil of other parts of the East."

" Is there no virgin ground in Java ? "

" Oh yes, there are parts of Java that have never been cultivated, but it must be remembered that these parts have been neglected by the Dutch planter, no doubt for good reasons, amongst which were probably the absence of facilities of communication and transport."

" The rubber trees in Java, then, have not done particularly well ?"

" The growth of the Hevea, planted on an elevation up to 1,500 feet above sea level, does fairly well, but I think that the effect of planting trees above that elevation is that they will be one to two years backward in growth. However, the trees are quite healthy. You must remember that not only is the quality of the soil important ; climatic conditions have also to be considered. All planting in the East to a great extent is the sport of weather conditions. Given a few seasons of the right amount of rain and sun, I have no doubt the trees will make up an existing backwardness of growth."

" There is one advantage that the Java planter has over his less favoured rivals—the presence of a large population ?"

Well, yes. The population is there, but the labour has to be trained from the start. There is no large body of trained labour, and the Javanese are not good workers—far inferior, in my estimation, to Chinese coolies. The Javanese coolie is incurably lazy. He will work to satisfy his needs, which are small, but further than that you can devise no incentive. So long as he receives forty cents (Dutch) per day for his own work and thirty cents for his wife's, he is satisfied. The experiment was once tried of increasing the daily wage by fifteen cents, with the result that at the end of the week the estate was deserted ; the Javanese had retired for a time to live upon their accumulated capital."

" Do you find the land regulations satisfactory ?"

" They work well enough so far as Dutch subjects and Dutch companies are concerned, but the shareholder interested in a Dutch East Indian plantation must bear in mind that the English company has no *locus*

standi when dealing with the Dutch Authorities. An English company can, and does, hold all the shares of a Dutch company, but it is only the Dutch company that actually holds the lease of the property who can deal with those authorities. What I say here does not refer to a few freehold properties still existing in Java."

"Is the Dutch Government friendly towards the introduction of British Capital ?"

"Quite. The Government welcomes capital that is really put into the land. The local authorities are most friendly and helpful to the planters, and in cases of bad seasons they have always been very fair in granting extensions of time for payment of rent. I do not know, however, whether they will be so considerate towards plantations practically run by British companies. My own opinion is that the Legislative Council in the Dutch East Indies is not sufficiently iudependent of the Colonial Minister of the Home Government."

"What kind of trees do you favour for the Java plantations ?"

"I have come to the conclusion that above an elevation of 1,500 feet Hevea cannot be cultivated with advantage. On the low grounds, of course, no other tree can compare with it. For the higher elevations I consider the Ceará tree likely to produce the best results."

"Which of the Manihots do you recommend ?"

"It is too early yet to say definitely; but I have had very good reports of the Dichotoma. Experiments are being made, and judgment will go by results."

"You have not been troubled much with disease ?"

"No, with the exception of a disease in the Ceará trees, which is now being investigated. Otherwise one can say the trees have been generally healthy. When a disease occurs it is generally reported to the nearest proof station. There are several in Java. At every proof station there are specialists who diagnose the specimen of the infected plant or insect which has been sent to them and prescribe a treatment, and when considered necessary a specialist, at the request of the planter, very often visits the estate and deals with the matter on the spot."

"What is your opinion of the value of the *Ficus elastiça* and the Castilloa ?"

"Frankly, I consider it waste of time to cultivate either."

"Does what you have said about Jàva apply to Sumatra ?

"No. The soil of Sumatra is virgin, and, the climatic conditions being similar, the island should rival the F. M. S. as a rubber-producer. Indeed, not that all the best positions in Ceylon, the F.M.S., and Java are occupied, the future, so far as new plantations in the East are concerned, will, in my opinion, be with Sumatra. A little while ago it was unsafe to travel there, but the Governor-General, Van Heutsz, has effected a great change; the island is now efficiently policed, and travelling is safe. I therefore consider there is scope for a considerable increase in the planting industry in that island, as there is still much land suitable for cultivation. In my opinion, virgin land in Sumatra, secured at a reasonable price, well looked after by commercial agents established in that island, and constantly supervised by a visiting agent, with a reliable planter as manager, after five years at the utmost that would elapse before the estate came into bearing, should annually yield a handsome return to the investor, as rubber production, as far as one can judge, will be for many years to come a most

profitable industry. I am convinced that if investors in general will consider this point carefully they will much more profitably invest their money in an enterprise of that kind, than in a company purchasing an existing plantation at an inflated price, or in the purchase of shares of existing companies at a very high premium."

"What is your opinion of the rubber market; do you expect rubber to rise or fall?"

"So long as the Brazilian output is practically an unknown quantity and no trust can be placed in Brazilian estimates and statistics, so long shall we be unable to forecast market conditions with any degree of accuracy. Speaking generally, I should think rubber for the next twelve months is likely to fluctuate between five and six shillings. But it is not safe to prophesy. Anyway, I do not expect any recurrence of the boom."

"What do you look upon as the principal factor leading to success in the rubber industry?"

"Sound local management. Everything depends upon that. Experienced commercial and visiting agents are essential to success; and it is always to the good to have upon the board of a rubber company directors who have personal knowledge of planting, and who from time to time pay visits to the company's estates. The visiting agent is a most important official. All that is necessary to be done on the estate is carried out under his supervision, and he must be entirely independent of the manager, and hence it is advisable that the visiting agent, who must be an expert planter, should constantly visit the estate. The use of the automobile in this connection is of great value, as it enables the visitor to cover the necessary ground in the shortest possible time."

"On the whole you feel satisfied with the general condition of the industry?"

"Yes, it seem to me, speaking generally, to be established on a sound basis. There will be disasters, ne doubt, as during the boom estates were taken over in a hurry, were not properly cleared or cleaned or holed, stumps were stuck in anyhow, and the result called a plantation. Many such plantations will, no doubt, come to grief. But well situated, managed and financed estates, with constant skilled supervision, will pay."—*The Rubber World.*

Drying Rubber on Plantations.

Planters in the East have from time to time experimented with various methods for drying rubber. In the early days the use of a rotating heated cylinder was suggested to dry the rubber in films immediately after coagulation; at a later date some planters, in order to facilitate drying, chopped the rubber into small threads or worms, and subsequently reunited these into crops when dry. On many estates vacuum dryers have-where supervision has been provided-been quite a success, but it is only fair to say that vacuum dryers require more skilled supervision than most of the other devices yet invented. Where tea, coffee, or even tobacco, are grown in addition to rubber, it is customary to dry the rubber suspended on long poles when in the form of crepe, or on shelves of ordinary wire netting, the house wherein the cocoa, tea or coffee is dried being used for rubber as space permits. On the majority of Malayan estates the curing or drying house consists of a corrugated iron building with a fan at one end in order to drive out the hot air. These buildings are generally two storeys high, so as to permit of coagulation and general manufacture on the ground floor, and drying and packing on the upper floor. The length of time which the rubber remains in the drying house is to a large extent dependent upon the thickness of the rub-

ber sheets, biscuits or crepe, and also on the presence or otherwise of heating apparatus.

Many estates find that with an ordinary two-story building supplied with corrugated iron roof the heat in the upper chamber is sufficient for most purposes; in other cases a furnace is supplied outside the building and from it are run lengths of hot-air piping through the upper chamber. The *India-Rubber Journal*, from which these remarks aro quoted, publishes illustrations which give an idea of the usual building provided on Malayan estates, and also of the interior of the drying shed where strips of crepe many yards in length are suspended from timber or bamboo poles running the length of the building. By the simple means of a corrugated iron shed with a fan at one end many planters are able to turn out the rubber perfectly dry within a week of harvesting. It is said that the drying of rubber is largely influenced by the rapidity of coagulation; if the latex is coagulated very rapidly drying is done in a much shorter interval of time.

Some Suggestions.

The progress of the industry of cultivated rubber seems now to be settling into a steady business, but it still is capable of impovement in many ways, and the young planter who thinks he has learnt all there is to learn after six months residence on an estate probably will be found to be still ignorant of what he has to learn. In the last number of the Bulletin we quoted some important articles on the irregularity of the product from the manufacturer's point of view. It is not that the product is exported merely in different forms, crepe, sheet, block or scrap, the complaint is that the various portions of the samples are not similar and do not vulcanise in the same way. It is absolutely essential that each lot pnt through the machine in the factory should be homogeneous, and grading the sheet or crepe will be one of the important duties of the planter in the future. It is not always easy to see the cause of the difference in the age of the trees tapped, or to differences in preparation. Possibly, there is occasionally too much hurry in the drying shed or possibly whem smoking is used there is irregularity in the amount of smoke used or duration of the smoking. It seems quite clear that in future all rubber in sheet or biscuit will have to be smoked, and smoked well. This will require material for making the smoke, which material, whether of wood or cocoanut husk, or other fuel, must be sufficiently abundant close to the estate, and sufficiently cheap. The estate whose manager has destroyed all timber accessible in order to plant more rubber trees and has no other smoke material to fall back on will probably suffer considerably. It was the exhaustion of firewood and timber accessible to the plantations that was the main cause of the death of the pepper and gambier industries of Singapore.

Some time ago a specimen of crepe was brought to me spotted all over with black stains, the manufacturer alleging this was due to the oil used in the crepe machine which had got into the rubber. The specimen was an extremely weak, rotten rubber, speckled all over with dirty looking spots of some mould or other fungus, and its state was obviously due to careless and dirty work. Probably the water used in washing was foul, or the latex vessels or other apparatus dirty. Now, there is no reason why the rubber sheds should not be kept absolutely clean. I have seen the drying sheds and storing sheds in plantations in contact with the coagulating shed. The floor of the latter mud with puddles of water and latex decomposing a sloppy mess all round the drying shed. The drying shed, which should be on a slope so that rain should run off, was put on a flat piece of ground which in rain was beaten into muddy puddles. Can anyone wonder that the rubber gets affected by moulds and bacteria breeding in the slops around? The

washing and coagulating sheds or any sheds where water is used and likely to lie about in puddles should be a good distance away from the drying and storing sheds, which should be put on a dry slope if possible. Again, many of the working sheds I have seen are unnecessarily dark, which with the dampness of the floor is a direct inducement to the moulds and bacteria to breed and affect the rubber. Though these moulds, and such things as bloodspot generally appear only after the rubber has been drying for a few days, it seems quite clear that they start their attack as soon as the latex is coagulated and probably in some cases get into the latex itself as soon as it is brought in. There really is no reason why the working sheds should not be dry, light, and airy. Washing sheds or coagulating sheds must necessarily be damp, but they can be kept clean and the rubber removed far away from them as quickly as possible. . . . . It is quite a treat to see the packing and packed boxes on most estates now. Still, it is clear that there are cases in which the packing coolies are not sufficiently careful to see their boxes are clean, and it seems a pity good crepe should be spoilt by a little carelessness or hurry on the part of the packer.—*Agricultural Bulletin of the Straits and F. M. S.*

The Propagation of Ceara Rubber.

Kew summarizes the pros and cons of Ceará as follows :—

(1). The plant is readily propagated both from seeds and cuttings. Seeds are abundantly produced in almost every part of the world where the plant has been introduced. They may be gathered from plants when only three to five years old. Therefore there is the great advantage that a large area could be planted within a comparatively short period. Sowing the seeds in the position where they are to grow permanently is universally adopted in Brazil. It is possible, if adopted elsewhere, this plan would greatly reduce the cost of establishing plantations.

(2). The Ceará rubber plant is very hardy, a fast grower, free from insect and fungoid attacks, requires little or no attention when once established, and thrives in poor, dry and rocky soils, unsuited to almost any other crop. It is evident, however, that the yield of a few trees cannot be remunerative and only large areas can hope to make the industry a paying one.

(3). It produces a good class rubber, second only, when well prepared, to the best Pará rubber. For this there is a steady and continuous demand. The yield per tree is apparently small, but a return is obtained earlier than from any other rubber plant. With thick planting and judicious thinning as the trees grow up it may be possible to increase the yield hitherto recorded; whilst with skilful treatment the permanent trees may be tapped twice yearly, and last in a productive state for fifteen to twenty years.

(4). In spite, therefore, of the apparent want of success which so far has attended experiments with Ceará rubber plants in Ceylon and other countries, the increasing importance of rubber as an article in large demand in all civilized countries at good prices, suggests a reconsideration of the merits of this interesting plant. In many of our Colonies possessing a dry climate and a poor, stony soil, it is possible that large areas could be profitably occupied with Ceará rubber trees, so grown as to provide annual crops for tapping.

Manihot glaziovii by the way, is derived from Dr. Glaziou, who sent specimens of this variety to Kew from Rio.—*Tropical Life.*

The Planters' Chronicle.

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Tephrosia Purpurea Seed.

In issue of November 12, 1910 (*P. C.*, Vol. V, No. 43, Sc. O. Note 79, p. 565) it was remarked that it was intended to treat the seed of *Tephrosia purpurea* with Sulphuric Acid before delivering the seed in execution of orders from planters.

In the light of later experience it has been decided that treatment with sulphuric acid is *not* necessary in the case of seed intended for the planting districts. Whatever may be said of the plains, where the germination of the seed in its natural state is said to have been unsatisfactory, reports from the Nilgiris, the Anamalais and Mysore State all tell of a high percentage of germination.

Planters are requested to take note, therefore, that if they wish to have seed that has been treated with sulphuric acid they should kindly make a stipulation to that effect when ordering. Unless this is done the seed will be supplied in its natural state.

Cattle Diseases.

It was resolved at the last Annual Meeting of this Association :—

> " That this Association expresses its appreciation of the steps taken by Government to mitigate rinderpest and anthrax by the appointment of Veterinary Assistants for inoculating animals against these diseases, and at the same time would suggest that measures should be taken for the destruction of the carcasses of animals which may die of infectious diseases on the main roads."

This was communicated to the Government of Madras on 20th August 1910, and the following extract from G. O. " P. No. 889, Revenue, dated 27th March, 1910," is published here for the information of planters :—

> " The Government consider that the carcasses of all animals which die of infectious disease on the road should be buried at the cost of Government in view of the danger of spreading disease by handing them over to persons claiming to be the owners. The amendments to paragraph 5 of section 42 (Cattle disease) of Chapter V. of the Village Officers' Manual proposed by the Board are accordingly approved subject to the omission of the words ' and the owner of the animal is not known ' occurring in the last part of paragraph 5 (11).

International Rubber Exhibition.

Subscriptions to the U.P.A.S.I. International Rubber Exhibition Fund received up to the 31st March, 1911, are as follows:—

	Rs.	a	p.
Government of Madras	3,000	0	0
Malabar Coast P. A. (including Cochin Govt.'s donation) ...	2,540	0	11
South Travancore P. A.	1,583	6	0
Mundakayam Rubber P. A.	1,205	6	0
Shevaroy P. A. (per Mr. Cayley) ...	504	0	0
Central Travancore P. A.	63	8	0
South Mysore P. A.	42	8	0
Kanan Devan P. A. (Mr. E. E. Williams)...	25	0	0
Rs...	8,963	12	11

Para Rubber Seed Kernels and Oil.

In view of what was written in Scientific Officer's paper, No. lviii (*P.C.*, Vol. VI, No. 10, p. 122) considerable interest attaches to the contents of a letter received by the Planters' Association of Ceylon from Professor W. R. Dunstan, Imperial Institute, on the above subject.

Planters in Southern India will no doubt remember that the Scientific Officer is a strong believer in the policy of exporting the Oil only, reserving the poonac for use as a fertiliser.

The letter reads as follows:—

"I decide to draw the attention of your Association to the favourable opportunity which exists at present for placing supplies of Pará rubber seed kernels or oil on the European markets.

"Investigations conducted at the Imperial Institute have shown that Pará rubber seed oil is suitable for technical use as a substitute for linseed oil and similar drying oils, and technical trials with the oil conducted by manufacturers at the suggestion of the Imperial Institute have afforded conclusive confirmation of this view. Full information on this subject is given in the "Bulletin of the Imperial Institute," Vol. 1 (1903), p. 156; Vol. 11., (1904), p. 22; and Vol. VII (1909), p. 95.

"Owing to a variety of causes, such as the failure of crops and the application of certain oils to new uses, there is at present a great scarcity of oil seeds and oils in Europe, and for some time past the prices of these seeds have been rising steadily. Linseed oil, which was worth £31-10s. per ton a year ago, is selling at £41 per ton at present. It is probable that Pará rubber seed oil would fetch about the same price or possibly at first a little less than linseed oil, and it seems likely that Pará rubber seed kernels would now realise more than the £10 per ton at which they were valued in 1903. In considering export, there are several questions to be considered.

Cost of Collection.

"In an article contributed to a recent number of the *Journal d'Agriculture Tropicale* (September 1910) Mr. Petch, of Peradeniya, Ceylon, expresses the opinion that the cost of collecting the seeds, which he estimated at 4*d*. per 1,000, would render export of the kernels unremunerative. The estimate of the cost of collection appears excessive in view of the statement made by the Director of Agriculture for the Federated Malay States, in his report for 1908, that the seeds could be probably collected at 4 cents (1*d*.) per 1,000. Further, as indicated above, it should be remembered that well prepared kernels will probably fetch, at present, more than the £10 per ton, which Mr. Petch assumes as their value in Europe. There

seems to be no reason why the collection should not be managed by children.

"It is useless to attempt to export un-shelled seeds. The shells form at least 50 per cent. of the whole seeds, and are of no economic value, so that they add very considerably to the cost of the freight, and in addition have to be removed before the kernels can be used for the expression of oil. The question resolves itself therefore to exporting (*a*) *shelled kernels* or (*b*) *expressed oil* and possibly "cake." For the preparation of the former, shelling machinery will probably be needed. There is no perfectly satisfactory shelling machine for these nuts on the market, but trials made at the Imperial Institute show that "Miller's Nutcracking Machine," sold by Messrs. Miller Brothers, Limited, of 43, Beaufort Street, Liverpool, gives fairly satisfactory results.

"When this machine is used, the broken shells have to be picked from the kernels by hand, but this work can be done quite well by children. The machine should be driven at such a rate as will serve to break the shells, but not damage the kernels, as the latter deteriorate rather rapidly when broken. The machine may be seen at work at the Imperial Institute. The shelled kernels should be thoroughly dried in the sun, or by artificial heat as rapidly as possible, and then shipped in bags. Under these conditions, is believed that they will travel well.

"The preparation and export of oil is a larger question than the separation and export of the kernels, since special machinery would be needed.

"The actual price obtained for the kernels of Pará rubber seed in Europe will depend eventually to some extent on the value of the cake left after the expression of the oil. Analyses of this cake made at the Imperial Institute show that it is probably at least equal in feeding value to linseed or cotton-seed cake, but so far it has been impossible to obtain sufficiently large supplies of the cake to permit of feeding trials with cattle being undertaken, and until this has been done nothing definite can be said as to the suitability of the cake for feeding purposes. Moreover, the cake has been found at the Imperial Institute to yield small quantities of prussic acid. This is, of course, also true of linseed cake, but the fact makes it very important that feeding trials of Pará rubber seed cakes should be made at the earliest opportunity. In Ceylon it is certain that the cake would be valuable as a manure.

"Enquiries have been received recently at the Imperial Institute from manufacturers desirous of obtaining supplies of Pará rubber seed kernels or oil, and from this and the facts quoted above it seems certain that consignments of these products in good condition would meet with a ready sale. I shall be glad, therefore, if your Association will reconsider the whole question and inform me as to the possibilities of the suggested industry."

San Paulo Coffee.

At a meeting of the committee charged with the management of the State of San Paulo coffee, held in Paris in February, it was decided with reference to Clause 1 of the circular to the coffee trade dated January 5th that:—600,000 bags of coffee will be sold on April 1st at best possible prices in the following places:—About 300,000 bags in New York, about 125,000 bags in Hamburg and Bremen, about 112,500 bags in Havre, about 5,000 bags in Marseilles, about 25,000 bags in Antwerp, about 20,000 bags in Rotterdam, and about 12,500 bags in Trieste. A further 600,000 bags will be sold in April 22nd on the different markets, at a price not less than 75f. on the basis of good average Havre types for spot coffee. The committee have fixed this, as they hold a firm offer on this basis for any or all of the 600,000 bags mentioned under Clause 2 remaining unsold at this price on April 22nd.

Scientific Officer's Papers.

LIX.—AN ADDRESS DELIVERED AT A MEETING OF THE NILGIRI PLANTERS' ASSOCIATION HELD AT OOTACAMUND ON 23RD MARCH, 1911.

Mr. Chairman and Gentlemen,—It gives me much pleasure to be able to attend this meeting and have an opportunity of addressing you. Thanks to the excellent arrangements made by your Secretary, I have been able to make a somewhat extended tour of the district, and I am glad to find that your 'ever green pest' the *Lecanium viride* is far less in evidence than it was a year ago, when I last had the pleasure of attending a meeting of the Nilgiri Planters' Association. This is undoubtedly due to the protracted monsoon experienced last year. As soon as the rain sets in the chief natural enemy of the Scale, a white fungus, begins its attack and kills large numbers of the Scales. Usually there is a spell of dry weather during September when the Scale is able to recover, but last year the rain was continuous until nearly the end of November, and, consequently, many Scales were killed off before they reached the egg-laying stage. A succession of such wet years would very largely reduce the pest.

I am still of the opinion that this pest can be controlled, and four different methods, or rather a combination of four different methods, should be used for the purpose.

First of all, Coffee on poor land, and on ridges, which has always been weak, and which has been severely hit by the Scale should be replaced by a more suitable crop, such as Tea or Ceará Rubber. It is coffee which under the best of circumstances only gives about two cwts. per acre, which reduces the profits on an estate. Indeed if all the items of expenditure on such poor coffee were totalled up it would often be found that it was an annual loss. Therefore I advise you to pull it out, and concentrate your labour, and money, on the good portions. I would call your attention at this point to the suitability of Ceará Rubber as an alternative crop on the lower elevations. I have had the pleasure of inspecting some of this rubber in the Kullakamby district which has recently been tapped, and I consider that, not only is the growth very satisfactory, but the biscuits which have been made are most encouraging. A great deal of old coffee land on the lower slopes of the Nilgiris is suitable for Ceará Rubber and it is well worth while planting it up. There is no doubt that it is a paying crop and it has become increasingly popular in the market of late years. It will be very interesting to hear what is said about this kind of Rubber at the International Rubber Exhibition this year. This, however, is a digression.

The second factor to be made use of in the control of Green Bug is spraying, or washing, with insecticides. Now, Gentlemen, whatever may be said against this method it must be remembered that insecticides do kill the scale, and if they are properly applied they will rid the trees of bug. Two applications at least are necessary, the second one to kill the insects which hatch from the eggs which escape the first application. At the same time as many Ants as possible should be killed and their nests hunted for and destroyed, since they protect the scales during bad weather and distribute them about the trees when the weather is favourable. The red Ant and the little black Ant which carries its 'tail' curved up over its back are the worst offenders. Whether at the present prices of Coffee it will bear the cost of any extensive spraying operations is a matter which the individual planter must decide for himself.

The third method is the use of disease-resistant hybrids, and I strongly advise you to supply your coffee only with such hybrids. I am glad to be able to tell you that our application for a plot of Government land on which

to conduct experiments in Coffee hybridisation has advanced considerably, and the Collector of the Nilgiris has not only taken a kindly interest in the scheme but has done much to forward it. Before next near I hope that we shall have made a start. In the meanwhile good work is being done with hybrids in South Mysore and Coorg and a limited amount of seed is available from time to time. These hybrids are highly resistant to leaf disease, and those existing in the Nilgiris are evidently resistant to *Lecanium*, since, though attacked by them, the leaves are large and healthy and the trees never assume the shuck, half dead, appearance of the ordinary Arabian Coffee under similar circumstances.

Lastly, if any permanent headway is to be made we must have some form of Pest Act to prevent badly attacked cultivation being abandoned and left to act as a centre of infection. Surely it is no hardship to insist on abandoned coffee being burned. Not only is a Pest Act needed to fight Green Bug, but also to prevent the possibility of the introduction of similar diseases. Green Bug need never have been introduced into the Nilgiris, and at present we have absolutely no means of preventing the introduction of a Tea disease, such for instance as Blister Blight, into these hills. If precedent is needed, every civilised agricultural country has some form of Pest Act; Travancore has what is virtually a Pest Act to deal with the Coconut Palm disease, and the Government of India is now considering an Act for the prevention of the importation of new pests into the country. What is needed is an Act which can be used locally, and I consider that it is the duty of planters to ask for such an Act and keep on asking for it until they get it.

Since we have no Experiment Stations at present I suggested at the last Annual Meeting of the U. P. A. S. I. that experiments should be conducted systematically on the estates themselves in the different districts and be looked after by Committees. During my tour I have been able to meet the various Experiment Committees which have been appointed in the Nilgiris and have arranged with them a number of interesting experiments. I trust that these will be carried out, and that the Committees will see to it that they are continued should the men actually conducting them go home, or for any other reason be unable to look after them themselves. Mr. H. L. Andrews has kindly undertaken to work out some life histories, more especially that of the ' Flush Worm,' a caterpillar which rolls the leaves of the Tea. At present the best method of controlling this pest is to pick off and burn the rolled leaves, but could we discover where it pupates it might be more easy to destroy the pupae. Pupation possibly takes place in the ground at the collar of the bush and if this is the case an application of some insecticide to the soil about the tree would kill it, but this point needs working out.

I particularly wish experiments to be tried with Nitrolim as a fertiliser for Tea. Speaking as a Chemist, I think Nitrolim is probably an ideal nitrogenous fertiliser for our soils which are deficient in lime ; we should in it apply an alkaline instead of an acid nitrate. It is also important to find out, as soon as possible, whether Nitrolim is suitable for Tea, Coffee and Rubber, since it is a fertiliser which could easily be manufactured in this country with its cheap labour and easily available water power ; some day it will, in all probability, be largely manufactured here.

The district appears to be remarkably free from serious diseases of Tea. The worst is Purple Mite, and the remedy for this is Sulphur, which should be dusted over the bushes early in the morning while they are still wet with dew, in order to make it stick, at the very beginning of the attack. I have

arranged for an interesting series of experiments to be conducted to determine the effects of pruning at different times of the year on this pest.

Now, Gentlemen, I should like to say a few words upon another subject which is on your agenda paper, namely the desirability of a Scientific Assistant for the Nilgiris. This is necessarily a somewhat personal matter, so that I must ask you to pardon me if I talk a little about myself. Since I took up the post of Scieutific Officer some two years ago the work of the Scientific Department has increased by leaps and bounds and it has reached a point where it can no louger be done by one man. I am kept constantly on the move throughout Southern India and I feel that I cannot do the work I am paid to do. I am constantly asked questions which I cannot answer because I have no time to find out, and I am unable to work out any diseases or definite problems. It has been suggested that a cess of eight annas per cultivated acre should be levied, six annas of which should go to the U.P.A. S.I. and two annas to the local Association. If this is agreed to by all the Associations three Assistants could be appointed who would live in the districts allotted to them, and planters could have a man on the spot to study local conditions, conduct experiments, and give advice, while I should be free to carry out my legitimate duties, which I consider to be research work in my laboratory at Bangalore with an occasional tour to lecture and meet planters at big centres.

I ask you to look at this eight anna cess from a business point of view as an investment. To Tea planters it means an added outturn of one pound of made Tea per acre. Now, Gentlemen, do you believe that Scientific advice can add a pound of made Tea to your outturn? If you do not, the sooner you give up scientific advice as a waste of money the better. To Coffee planters I would say spend eight annas per acre less on manures and trust to scientific advice to show you how to save it. I assure you that you now waste far more than eight annas an acre by applying the wrong manures at the wrong time, and properly directed scientific advice will soon show you how to manure more economically with better results in the way of crop.

I commend this matter to your serious attention for, I must admit with reluctance that the work that now falls upon my shoulders is more than I can accomplish single handed, and you are not getting the benefit which you might do from my knowledge and services. I ask you to seriously consider whether you cannot see your way to giving me Assistants to work in the districts under my guidance and thus to lighten the burden of detailed work which now falls upon me and which is rapidly becoming unbearable.

In conclusion, gentlemen, I shall be happy to take part in any discussion arising out of my address, or to try and answer any questions which you may care to put to me.

RUDOLPH D. ANSTEAD, *Planting Expert.*

At a meeting of the General Committee of the Indian Tea Association held at Calcutta on March 17, 1911, attention was drawn to a report that the Chinese Government, with a view to protecting the tea industry, were considering the passing of an ordinance prohibiting the entry into China of all foreign grown teas. It was pointed out that if the report was correct, it would be detrimental to the Indian tea industry, as a very considerable amount of tea dust and fannings goes to Hankow, there to be made up into tablet teas.

After discussing the matter the Committee decided, in the first place, to address the Consul-General for Russia enquiring whether any definite information regarding it had been received. A similar enquiry was also to be addressed to the Foreign Department of the Government of India.

DISTRICT PLANTERS' ASSOCIATIONS.

North Mysore Planters' Association.

Proceedings of the Annual General Meeting held at Balehonnur on March 20th, 1911.

PRESENT.—Messrs. C. P. Reed (President), C. H. Browne, C. Danvers, T. Hunt, C. S. Crawford, E. W. Fowke, E. C. Kent, F. I. Morgan, R. G. Foster, H. G. Bonner, W. H. Reed, E. C. Bolton, H. M. Northey, E. H. Young and A. F. Evetts (Honorary Secretary). *By Proxy* :—Messrs. E. Lund, W. St. Clair Johnson, A. C. W. Denne, D. Mathias, C. H. Trevor-Roper, F. J. Parton, H. Pilkington, N. G. B. Kirwan, J. H. Robinson, and S. L. Mathias. *Visitors* :—Messrs. F. W. Hight and H. Browne.

Honorary Secretary's Report and Accounts.—The Honorary Secretary read his report as follows :—Gentlemen,—There is a good deal of business to be got through to-day so I will not occupy your attention for many moments.

Since March last the following Estates have joined or re-joined : Betay Khan, Santaveri (Jiguy Khan), Gouikal Kurady Khan, Charmanhaddie and Bupponji being represented by Messrs. Kerr, Denne, Young, Reed (W. H.) and Errington respectively, while Wallagoondy is now represented by Mr. P. L. Mathias. These Estates represent a cultivated area of 1,365 acres. The total number of members on the rolls is 43 and of Estates 71, with an area of 21,442 acres, of which 14,864 is under Coffee, 117 Cardamoms, 574 Rubber only, and 5,884 jungle. The Association's income for the past year amounts to Rs.1,647-8-0, including Bank Interest on the Deposit account, which is Rs.337 more than last year's. This is due not only to the payment by members of all subscriptions for 1910 but also to the handsome manner in which men have paid up their arrears of subscriptions, a sum of Rs.223. There is now not a defaulter on the rolls of the Association ; we have a clean sheet. The expenditure amounts to Rs.1,700-12-10, that is Rs.53-4-10 in excess of the income. This is due in the main to two unusual items, *viz.*, Rs.150 towards a wedding present to H. H. The Yuvaraj and Rs.375 towards the Scientific Officer's Laboratory Equipment Fund. I think we have done well to be able to pay such a sum, Rs.525, out of income. The subscription to the U.P.A.S.I. including last year's balance, comes to Rs.616-10-8 against Rs.500 last year. Thus three items of expenditure amount to over Rs.1,141. The actual upkeep of the Association including Delegate's expenses to the U. P. A. S. I. meeting and Dusserah and messing at the Quarterly General Meetings totals only Rs.559. Including the cash balance from last year, the Bank Interest Rs.145-9-0 on Deposit account having been added to the principal, the sum of Rs.284-4-8 is carried forwarded to 1911. The actual Funds, as shown by the balance sheet, at the credit of the Association, amount to Rs.3,785-9-0 on Deposit account, Rs.284-4-8 at current account and in hand, and Rs.28-5-4 the balance of the Scientific Officer Fund, a total including interest due to us on Deposit account to-day of Rs.4,250 less 7 annas.

Benevolent Fund.—Looking at other Associations' subscriptions to this Fund we seem to have done pretty well, as our total comes to Rs.1,535 ; that is, more than double that of the next Association on the last list published. All promised subscriptions have been paid,

Scientific Officer Fund.—All subscriptions have been paid, one member increased his by Rs.5, so the total of this Fund is Rs.905, out of this I have paid our annual subscription of Rs.800 as well as Rs.76-10-8 on account of last year's balance due to U.P.A. There is a sum of Rs.28-5-4

in hand. Next year besides the Rs.800 U. P. A. Subscription, Rs.125 will have to be found to pay our share of the upkeep of Sc. O. Laboratory, that is, Rs.925 against an income of Rs.905 under this head.

Gentlemen, in conclusion, I have to thank members for the courtesy shown me in all correspondence, etc. In laying the accounts before you for audit and inspection I beg to submit my resignation of the Honorary Secretaryship and do not seek re-election.

The accounts were audited and passed by Messrs. Hunt and Foster.

President's Address.—The President addressed the meeting as follows:—

Genlemen,—I will not take up much of your time as there has been nothing of much importance done during the past year. The only item that engrosses our attention now is the Scientific Officer Scheme and Mr. Browne's proposal to increase the subscription to 8 annas per cultivated acre, to enable us to engage the services of an assistant to Mr. Anstead for North and South Mysore and to help to make the U.P.A.S.I. a power in the land and put it on a firm financial basis.

In October last you were furnished with a copy of Mr. Browne's proposal and were asked to express your views on the subject, but I am sorry to say only 2 or 3 members responded to the invitation. These were in favour of the proposal.

After Mr. Danvers addressed the Meeting held at Balehonnur on 9th January, two resolutions were unanimously passed and you were also furnished with copies of what transpired, but I much regret te say the second resolution, which was drawn up with the best intentions and in no spirit of coercion or attempt to snare the members, has given offence in some quarters.

It is for you to decide to-day whether the second resolution which has caused irritation be altered and put in another form.

As far as I can see, the members who have objected to the resolution in question are in favour of Mr. Browne's proposal, which I hope will be eventually unselfishly and unanimously carried, and that our example will be followed by all the other Associations. One Member is willing to vote in favour of Mr. Browne's proposal provided one or more of the Association Meetings are held every year in Chickmaglur, and I hope the next executive can see their way to do so; at the same time I think every consideration is due to the executive who have to do all the work and attend all the meetings, and their convenience should be studied.

Gentlemen, I beg to tender my resignation and do not seek re-election.

Election of Office-bearers.—The following were elected for the year 1911:—Messrs. C. P. Reed, (President), E. C. Bolton (Vice-President) and A. F. Evetts, (Hon. Socretary).

The following resolution was then proposed by Mr. C. H. Browne and seconded by Mr. H. G. Bonner: " That with a view to meeting the convenience of members residing in the vicinity of Chickmaglur at least one quarterly general meeting shall be held in Chickmaglur each year."—Carried unanimously.

Scientific Officer Scheme and Increase of Assessment.—The resolutions passed at the Quarterly General Meeting held on January 9th were read. Messrs. Hunt, Bolton, Danvers and Browne addressed the meeting, and after a lengthy discussion the following resolution was proposed by Mr. Bolton and seconded by Mr. Bonner: " That the resolution (2) passed at the meeting held on January 9th, raising members' subscriptions to the Association to 8 annas per acre be confirmed with the following exceptions: 'That no subscription shall be paid on land cultivated with any product other

than Coffee, Tea and Rubber, and that on Rubber, until four years of age, only half rates shall be paid. That the Scientific Assistant to Mr. Anstead shall confine his work entirely to North and South Mysore. That the subscription of 8 annas per acre shall cover all expenses, *viz.*, the upkeep of the Association, subscription to U.P.A.S.I., existing Scientific Officer Fund subscriptions and all calls upon members other than the Benevolent Fund." '

This resolution was put to the meeting and the votes of those present and represented by proxy resulted in 54 votes being in favour of and 9 against it.

(It might interest members to know that the total number of votes of members in 1910 was 96; if the 27 silent votes had been included in those cast in favour of the above resolution, (as notified), the total would have been 81; two votes were uncertain, two were neutral, and two were in favour of assessment on Coffee only, and nine, as stated above, were against the resolution).

Labour Difficulties.—Read Mr. Bonner's letter regarding the enticement of a Writer and 100 coolies from the Honeyvale Estate, the particulars of which caused much indignation amongst members, and the following resolution was framed :—" Resolved that members of this Association be warned against entertaining assistants and superintendents from Rubber Estates in Travancore who may visit them ostensibly for social reasons but in reality to recruit labour from neighbouring Estates, and that a copy of this resolution be sent to the South Travancore Planters' Association."—Carried unanimously.

Read Mr. Parton's letter dated March 10th, also letter dated March 16th, and enclosure from the Hon'ble Mr. J. G. Hamilton.

Gambling—Read letter dated January 24th, from the Deputy Commissioner, Kadur District.

Roads.—Read letter dated January 13th, from the Executive Engineer, stating that he had called the attention of the Sub-Divisional Officer to the portion of the Wastara-Koppa Road complained about.

The Honorary Secretary was requested to write again to the Executive Engineer regarding this road.

Excise—The Honorary Secretary reported that the toddy shop in the vicinity of Adigebyle is supposed to be closed.

Service of Warrants.—Nothing further has transpired.

The meeting closed with a vote of thanks to the President and Honorary Secretary.

(Signed) A. F. EVETTS, *Hon. Secretary.*

Import Duty on Wire Netting.—The Committee of the Indian Tea Association, Calcutta, lately considered a letter dated 8th March from the Assam Branch, pointing out that wire netting is largely used by tea estates for fencing purposes, and that although fencing wire and wire rope are charged only one per cent. duty, wire netting is assessed at five per cent. which adds considerably to its cost. The General Committee were asked to take the matter up, with a view to wire netting being placed on the same footing with fencing wire.

The General Committee were disposed to agree with the view taken by the Assam Branch, that wire netting should be placed in the same category with fencing wire. The former is extensively used for fencing purposes of one kind or another, and there seems to be no good reason why one description of fencing material should pay an *ad valorem* duty of only one per cent., while material of another kind, used for the same purpose, should be assessed at five per cent. duty *ad valorem.* It was decided to address the Committee of the Bengal Chamber of Commerce suggesting a representation to Government on the subject.

INDIAN TEA CESS COMMITTEE.

Extract from Proceedings of the Half-yearly Meeting of the Indian Tea Cess Committee held at Calcutta, on the 17th February, 1911..

ADVERTISING IN AMERICA.

The Chairman, in inviting attention to the proposal of the Executive Committee that £10,000 should be allocated for expenditure in the United States, referred to the procedings of the meeting of the Executive Committee held on the 4th January. The recommendations which had been made by the Indian Tea Association (London) were there set out, together with certain modifications, which the Executive Committee suggested. In regard to Mr. Blechynden, it was agreed that he was doing excellent work, and the Executive Committee considered that £10,000 should be allotted to the United States.

The Chairman then moved :—

"That a sum of £10,000 be expended on advertising Indian tea in the United States."

The resolution was seconded by the Hon'ble Mr. Cathcart and, on being put to the meeting, was carried unanimously.

The Hon'ble Mr. Skinner suggested that the statistics of the tea trade in America, which were given in the proceedings of the meeting held on the 20th December, should be published for general information. Questions were often asked as to what was being done in the United States ; and, although the figures did not differentiate between Indian and Ceylon teas, they afforded tangible evidence of the progress which had been made.

The Committee agreed with this suggestion, and the Secretary was instructed accordingly.

ADVERTISING IN EUROPE.

The Chairman next asked the meeting to consider the proposal of the Executive Committee that a sum of £5,000 shall be expended in Europe. He said that, for the year ending 31st March 1911, a sum of £7,000 had been allotted. But it appeared that there would be an unexpended balance of £1,500 from that allotment, so that the total amount available for the year ending 31st March 1912, would be £6,500. He thought also that he should remind the members of the expression of opinion contained in the proceedings of the Executive Committee, dated 4th January. The Executive Committee were somewhat disappointed that the scheme for an advertising campaign in Germany was not referred to by the Indian Tea Association. No explanation has been offered as to why this scheme was not to be proceeded with. In the circumstances the Executive Committee had taken up with London the whole question of work in Europe, and were now awaiting the result of their communication. In the meantime they thought that the sum of £5,000, which had been recommended by London, should be allocated.

Mr. S. G. Anderson then proposed :—

"That a sum of £5,000 be expended on advertising on the Continent of Europe."

The resolution was seconded by the Hon'ble Mr. Henderson, C.I.E., and, on being put to the meeting, was carried unanimously.

ADVERTISING IN THE UNITED KINGDOM.

The Chairman next invited consideration of the proposal of the Executive Committee that a sum of £4,000 should be expended on advertising in the United Kingdom. He said that the London Committee of the Indian Tea Association had suggested the allocation of a much larger sum ; but the Executive Committee were not in agreement with them on that point. As members present would remember, at the meeting on the 26th January

1910 there was some discussion on the subject; and a feeling against heavy expenditure in England was evinced. This view was communicated to the London Association, as was also a request that tangible proofs of the success of the campaign should be forthcoming. The Association was convinced that good value was being obtained for the money expended; but the Executive Committee could not come to the conclusion that the results were so good as to justify the doubling of the allotment. It had however to be remembered that the Association was practically committed to an expenditure of £2,000 at the Crystal Palace Exhibition. And if the proposal of the Executive Committee were accepted, it would mean, therefore, that this amount would be available for the Exibition, and an additional sum of £2,000 would be provided for the advertising scheme. He moved :—

> "That a sum of £4,000 be expended on advertising Indian tea in the United Kingdom."

The Hon'ble Mr. Skinner supported the proposal of the Executive Committee, because he understood that advertising in the United Kingdom did not come, strictly speaking, within the scope of the Cess Act. But at the same time he thought that they must all recognise the good work which was being done by Mr. Duchesne under the London Association. If this good work were to be maintained and extended, the expenditure of more money was essential. The China Tea Association had provided liberally for pushing the sale of China Teas; and he thought that, under the circumstances, the London Committee were justified in making the request which they had made. And he suggested that if, after the various allotments were decided, there should be an unspent balance, a further sum of £1,000 should be allocated for the campaign in the United Kingdom.

Mr. Claud Bald was not in favour of Mr. Skinner's proposal. He understood that the campaign in the United Kingdon was originally started to combat the agitation in favour of China tea. The idea at that time was that the question of the wholesomeness of Indian tea should be agitated. But some hesitation was shown in that connection, and ultimately the agitation was diverted into its present channel. The *Lancet* had now definitely dispelled the idea that Indian tea was unwholesome, and very little reason consequently existed for the continuance of the campaign. But he agreed that Mr. Duchesne had done good work in generally advertising Indian tea, and he was, therefore, in favour of the proposal of the Executive Committee. But he would be certainly opposed to an increase of the grant beyond £4,000.

The Hon'ble Mr. Skinner, in replying to Mr. Bald, said that when he was at home last year he found that, in many clubs and large restaurants, a great deal more China tea was used than formerly. In some of the principal tea rooms, such as those in the Army and Navy Stores, it was a fact that unless Indian tea was specially ordered, China tea was served. This showed, he considered, the extent to which China teas had been brought into favour, as the result of the money which had been spent in advertising them. For that reason he hoped a larger grant might be made available out of unallotted funds, there being no object in maintaining an unexpended balance.

The Vice-Chairman was inclined to support the view expressed by Mr. Bald. His reason was that the consumption per head in the United Kingdom was, according to the latest statistics, 6·31 lbs.—the highest that had ever been reached. And Indian tea continued to get its fair share of the increase which had taken place. But cheap China teas were bound to come into consumption when the prices of the British grown product had risen as rapidly as they had done of late. The fine China tea that is served in high class tea rooms is however a special article; and he did not think

that anybody would suggest the employment of Cess funds for pushing the sale of teas of the finest quality. They had to remember that the production of medium and common tea was the largest factor in the Indian industry. Fine teas have a very limited market; and the Cess could not undertake to advertise them. Moreover, the Cess was originally started with the object of doing pioneer work. The idea of spending money in the United Kingdom was certainly not contemplated when the Cess was introduced, but the provisions of the Act were made wide in their scope, so that the operations of the Committee might not be unduly hampered.

The Hon'ble Mr. Skinner then moved, as an amendment, that, if possible, the allotment of £4,000 should be increased by an additional sum of £1,000.

There being no seconder to this proposal, the Chairman put the original resolution, which was seconded by Mr. Bald, and carried.

INDIAN TEA IN INDIA.

The Chairman said that the Executive Committee proposed to re-allot the sum of £2,000 for a bonus on the manufacture and sale of compressed tea in India. This proposal had been under consideration for a long time. The idea was that tablet tea was to be manufactured and sold in India. But difficulties had arisen, because no suitable machine was at the time on the market. A machine which was believed to be able to do the work, had however, at last arrived in Calcutta; and there seemed to be a prospect of the manufacture being undertaken. One of the primary objects of the Cess was the introduction of tea among the people of India, and he thought, therefore, that any scheme which appeared to be at all promising should be given a trial. A number of attempts had been made, but none of them had met with any very striking success: but that was not, in his opinion, a reason why the Committee should cease trying. He had noticed, when touring up country lately, that certain classes of the people were quite willing to drink tea, if they could obtain it at a low price, or better still, if they could get it for nothing. And he believed that, if the Committee could continue their efforts, they might in time create a taste for tea among a large section of the working population of the country. He moved :—

> "That a sum of £2,000 be allocated for a bonus on the manufacture and sale of compressed tea in India."

Mr. Jackson said that he had not the least wish to oppose the resolution, but his experience in the South of India had certainly not been encouraging. It was true, as the Chairman had said, that the people of the country would drink tea if they could get it for nothing, or next to nothing; but the demand disappeared when a reasonable price was asked for the tea. He did not suggest that it was not worth while making a further effort in a new way. It might be that if the native of India obtained tea in a tablet form he would take to it more keenly. But, so far as his own firm were concerned, they had spent a fairly large sum of money, with absolutely no result. It was true, however, that this was some years ago, and conditions might have changed considerably in the meantime.

Mr. Bald mentioned that in his district (Darjeeling) the people were certainly taking to tea. Roadside shops, where tea was sold by natives to natives, were fairly common. At his own factory tea was sold in small quantities—a pound at a time—to natives.

The Vice-Chairman also supported the resolution, and remarked that there had been a considerable increase in tea drinking in Bombay, where, however, China tea was largely used.

The resolution was seconded by the Hon'ble Mr. Skinner, and, on being put to the meeting, was carried unanimously.

Indian Tea in South America.

The Chairman next asked the meeting to consider the proposal of the Executive Committee that an enquiry should be made into the possibilities of South America as a market for Indian tea. He mentioned that he had gathered, in conversation with Sir Thomas Lipton, that in his opinion South America was becoming a promising field for tea. It was generally admited also that some of the principal of South American Republics were progressing, and the Executive Committee had come to the conclusion that there may be possibilities in the country. They thought, therefore, that a commissioner might be appointed to visit South America, to enquire into the present conditions of the tea trade, and the likelihood of its expansion, and to report. The Commissioner might also perhaps prepare a scheme of advertising, which could be budgetted for later on if it commended itself to the Committee. The Executive Committee suggested that a sum of £2,000 should be set aside for the purpose, but he did not anticipate that the whole of this would be spent. He thought that the question of appointing a Commissioner would probably have to be largely left to the London Committee, as they were so much nearer the field of operations; but that would be a matter of arrangement for the Executive Committee to consider. He moved:—

> "That a sum of £2,000 be set aside to meet the cost of an enquiry "into the possibilities of South America as a market for Indian "tea."

The Hon'ble Mr. Cathcart seconded the resolution, which, on being put to the meeting, was carried unanimously.

The Chairman said that, before asking if any other gentlemen had business to bring forward, he wished to read the following letter which had been received from Mr. Bald, namely:—

> "I wish to suggest that, if it can be arranged, a member of the Tea "Cess Committee should be asked to pay a visit of inspection to "the United States of America, where our commissioner has been "working for so many years. I do not suggest that our com- "missioner has not been serving the Committee well; on the "contrary, he seems to have been working very energetically and "faithfully, but in view of the greatness of the work, and the "amount of money spent year by year, it seems to be advisable "for a member of the Committee to visit the spot, and discuss "the various features of the work with him, and to report in due "time to head-quarters in Calcutta.
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> "I have no personal interest in making this suggestion. I think that "a planter would not be the most suitable person to depute on "this work. It should be one of the members from a mercantile "firm in Calcutta, one who is acquainted with business methods. "If it is possible to arange with anyone who is going home this "year at any rate, to give a month or six weeks to this special "commission, I think it would be satisfactory to all concerned. "I am sure that our commissioner would like this as much as any- "one, as it would take some of the responsibility of his methods "off his hands.
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> "I shall be obliged if he will kindly bring this matter to the notice of "the Chairman of the Committee, and if he disapproves of the "suggestion it need not be brought forward at the meeting.
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> "Another matter which has been on my mind for some time is that it "would be advisable to procure from time to time samples of

"the teas which are pushed by our commissioner and sold by "the "jobbers" to whom the Commissioner frequently refers in "his reports. The samples should, if possible, be obtained from "the retail grocers, and be representative of the teas which they "are actually selling over the counter, and on arrival in Calcutta "the samples should be reported on by some firm of brokers. "This suggestion I make only for the Executive Committee to "consider."

The Chairman added that he entirely approved of both these suggestions, and he thought it might be recorded that the Executive Committee should be asked to make the necessary arrangements. He knew that Mr. Blechynden, the Committee's Commissioner in the United States, was very anxious that one or more of the members should visit America every year, and look into the work being carried on there.

The meeting signified its approval of Mr. Bald's proposals, which were to be recorded for the guidance of the Executive Committee.

IN LIGHTER MOMENTS.

Mr. Aylmer Ff. Martin's Almanac has exposed him to criticism besides eliciting much praise. He sends, for the amusement of readers, the following copy of a letter he received :—

"I am doing well and wish to hear of your welfare. In the Almanac "published by you is printed 'Work and Live in your own country happily "and peacefully.' It is quite correct. Which is the place you were born, "and now where you are and what work you are doing? Without taking "into consideration all these things, what made you to print a notice like "this? I request you will kindly write to me a proper answer to my "address given below or else I will lose my life, for the reason that I am "always in the habit of travelling to foreign places and earn my bread. "Ever since I read your Almanac, I stopped going outside and my "health thereby is becoming worse and I think I will lose my life at no "distant date . . . . "

To this gentle insinuation that he is not practising that which he preaches Mr. Martin replied as follows :—

"You must not think it rudeness on my part, not having replied to your "post card of the 3rd March sooner. The delay is caused by my absence "from headquarters and the contents of your card was only known to me "to-day. I am glad you have read my Almanac, and that you consider my "advice quite correct. In reply to your question, I inform you that I was "born in India. I was sent to Europe to be educated, but the water of those "parts did not agree with my system and so I was ordered by the doctors "to return in 1883 to India, the land of my birth, and I have never visited "Europe again. I am sorry your health suffers from remaining in one "place; if wandering keeps you healthy, it has, I am afraid, not made you "truthful, for you begin your post card by saying you are doing well and end "it by saying your health is becoming worse and you fear to lose your life "at no distant date. If you want honest employment in India, I can give it "to you. If you prefer foreign countries, from which lies are spread, then "India is better without you."

Mr. Martin asserts that the humour is to be found in his correspondent's letter, rather than in the reply; but both are published, in the hope that they will amuse.

TEA.

The Grocer and the Tea Trade.

Tea continues to make progress in popular favour, and it is estimated that the average British consumption is now over six pounds per head. This being the case, such a healthy state of affairs should encourage the grocers of the United Kingdom to make further efforts, not only to retain, but to increase their share of the trade. Though universally used, yet it is an article of which little is known by the general public. Latterly considerable attention has been directed to the article and fresh light has been thrown on a most interesting subject, but the cold fact remains that a very small percentage of those who daily drink tea, know anything whatever of its growth, origin, mode of manufacture or selection. A large proportion of the present generation hardly knows what fine or finest tea is, consequently during the last few years, consumers have been content to drink what is offered them, the result being that the palate has been educated to be pleased and satisfied with what is drinkable, but what is not fine or finest. It would be revelation to those whose ideals of tea have been gradually brought on to a lower basis, if they had an opportunity of drinking fine grades such as our friends in Ireland enjoy.

It is a debatable point if the public fully realise one important phase, the relation of the duty to the value of the tea. It has not been brought home sufficiently to the consumer that the duty is the same on a tea sold at 1*s*. 4*d*. as on one retailed at 2*s*. In the former case the duty is 31·25 per cent. of the amount paid for the tea, while in the better grade, the duty works out at only 20·83 per cent. If 3*s*. per pound is paid, the duty will be only 13·88 per cent. It, therefore, means that the extra amount is expended in securing better value in the actual tea, without paying anything more in duty. The family grocer has done much, and he can do more, to educate his customers, and by means of personal letters, handbills placed in every parcel which leaves the premises, free samples, etc., he can build up a valuable tea trade, notwithstanding the increasing pressure of competition. He can also by continual practical tests make himself acquainted with the teas which are peculiarly suited to the district in which he does business. In a great many cases he has the distinct advantage of personal influence, and is thus able to bring before the notice of customers his own particular blend. Another advantage which the grocer of to-day enjoys, is the facility with which he can at frequent intervals replenish his supplies. The large wholesale houses hold stock for his benefit, and he is, therefore, able to buy fresh teas from time to time and maintain a continuity in his blends. He may not have the time, knowledge or capital to select and blend his own, and in such a case it will be to his advantage if he buys his teas already blended and packed. Blending is a fine art, and obviously experts who devote their whole time to such work are in a position to give practical help and advice, which if followed out should bring satisfactory results.

In fact, the grocer is in a position to hold and increase his trade if he will only give this important branch of the business a fair amount of attention. One may perhaps pertinently ask why the tea trade has in some cases left him, and gone into other channels, and it may act as a stimulus if the question is met candidly and fearlessly. One potent reason is that he expects his tea trade to produce too much profit. He is satisfied with a certain percentage on other commodities, yet he handicaps his turnover in tea by burdening it with too heavy a margin. It is a fatal error to supply tea, say at 1*s*. 8*d*., which is not distinctly better in cup value than that offered at less money by his larger competitors. The criticism is so often heard that tea purchased from the grocer did not appear any better than one bought elsewhere at a

lower price. Only one result can follow; the purchaser does not return to the grocer, but continues to buy the lower and more advertised tea, and in time does not wish for anything better. Owing to the present high prices of common teas a larger proportion of these grades are of necessity being into service to meet the demand for the cheap canister. Consequently the intrinsic value of a blend composed of higher grades will be greatly increased, in fact its improved flavour and quality will be out of all proportion to the extra penny or so paid. It is generally found when common tea advances in price, that the better and best kinds become cheaper—the result being that if a slightly higher price above the common quotation is paid, a tea can be secured which is far superior. In fact the small advance in price bears no ratio to the increased value obtainable.

Such being the position, a fine opportunity presents itself of pushing a good tea, say at 1*s.* 8*d*, and if it is not overburdened with profit and is carefully selected, its superiority to the much advertised kinds will be so apparent that the consumer will not care to return to the lower standard. Another point which is receiving increasing attention, is the question of cup value versus appearance. In the olden days when the precious black and green teas were locked carefully away in handsome tea caddies, no doubt it was measured into the pot by the careful housewife, and she, therefore, had an opportunity of judging the quality by the appearance of the leaf. Nowadays hardly one out of ten looks at the tea they buy, so that the appearance of the leaf is a secondary consideration as long as it is not too small or dusty. It is a well known fact that the tea which has been manufactured solely to attract the eye, does not necessarily draw a fine liquor, but many kinds which cannot be described as good looking, often produce a fine infusion. The deduction is, buy for cup value, and do not condemn the leaf because it is not what is known in the trade as tippy.

An effort was made last year by the home trade to recreate a demand for fine teas, and it has undoubtedly done much good. The movement was of great educational value, but a great deal more can still be done, if the planters, Indian and Ceylon importers, and the tea-growing companies and their shareholders, will join hands with the distributors, and help individually and collectively to enlighten the millions who drink tea. The recent article in *The Lancet* has caused considerable interest, and no doubt when the salient points are arranged in a popular form, all who read will understand how science has proved that what the tea expert says is true, that is, that fine tea is better in every way than the lower grades. It is being arranged that some millions of this article expressed in familiar language are to be available for distribution amongst the people, and if every grocer in the United Kingdom will do all in his power to spread the truth, good of a far reaching character is bound to result.—*Produce Markets' Review*, February 25th, 1911.

China Tea.

An American consular report states:—

The future of China's tea trade would seem to rest with the finer qualities which have not yet been imitated elsewhere.

Steps are being taken to regain in some measure the trade in Ningchow teas. The viceroy and governor of Kiangsi has been asked to supply the growers of these teas with fertilizers, as their decline is largely due to farmers having neglected to clean the ground, turn it over, and fertilize it. In the Keeman district, where strict attention has been paid to these matters, the teas produced have attained great popularity, and the production, which amounted to 20,000 half chests a few years ago, reached 95,000 half chests in 1909.

The Planters' Chronicle.

RECOGNISED AS THE OFFICIAL ORGAN OF THE U. P. A. S. I., INCORPORATED.

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THE U. P. A. S. I.

(INCORPORATED.)

The Scientific Officer.

After returning from the Nilgiris on the 28th ultimo Mr. R. D. Anstead put in a few days work at headquarters. He leaves on Tuesday next *en route* for the Cochin district, whence he will proceed to South Travancore. At Cochin he hopes to be able to study the practical work of extracting oil from rubber-seed.

Mr. Anstead will in all probability be absent from Bangalore for more than a month.

Mr. J. A. Harris.

This gentleman visited the office on Wednesday last, and left Bangalore the next day on his way to England *viâ* Colombo. Mr. Harris retains his connection with the planting industry and the South Mysore Planters' Association, and will probably visit India again at some future time; but he will be greatly missed both in the South Mysore district and in respect to the work of the U. P. A. S. I., with which he has been long in touch.—*Ad multos annos!*

The International Rubber Exhibition, 1911.

On account of the Coronation the general arrangements of this Exhibition have had to be slightly altered, but the alterations are to the advantage of the Exhibitors and others concerned.

Saturday 24th June.—The Exhibition will be open to the Press (the public will also be admitted on this date by tickets that may have been issued by Exhibitors).

Monday 26th June.—Official Opening at noon.

The Exhibition will then be open daily (Sundays excepted) from 11 a.m. till 10 p.m. until Friday evening 14th July, instead of Tuesday the 11th as previously arranged.

Madras Agricultural Calendar, 1911-12.

This useful little annual has appeared in more compact form than its predecessors, and contains a great deal of useful information. About 60 pages of matter at the cost of 1 anna should appeal to the sympathies of all but the very poorest *raiyats* in Southern India, and there is variety as well as volume to attract the attention of the reader. The title-page gives a fine idea of the architectural lines of a part of the Agricultural College and Research Institute, Coimbatore, and the "calendar" is largely written both from and "around" that institute.

Cambodia Cotton.

The following Press Note has been received from the Director of Agriculture, Madras :—

Cambodia Cotton or American Cotton, as it is usually called in the Tinnevelly District, has made great progress during the last year, and probably more than 30,000 acres of the best garden lands in the Tinnevelly, Madura and Trichinopoly districts are now cultivated with this crop.

On good well-manured garden lands from 1,250 lbs. to 2,000 lbs. of kapas (seed-cotton) are obtained per acre, representing a profit of Rs.145 to Rs.250 per acre. It has the great advantage over all other garden crops that it requires much less water. A larger area of it can therefore be cultivated under one well, than of any other garden crop, and wells which have too small a supply of water for irrigating ordinary garden crops will suffice to irrigate a small area of Cambodia cotton.

Seed can be supplied at 9 pies per lb. exclusive of packing, etc., by the Dy. Director of Agriculture, Trichinopoly. About 10 lbs. of seed are required per acre, and a leaflet describing the method of cultivation in Tamil, Telugu and English will be sent free of cost to any one who applies to him.

Imperial Preferential Tariff.

Letters sent out with reference to the Resolution on the above subject passed at the Annual Meeting of the U.P.A.S.I. last year have resulted in a mass of correspondence. In great part this takes the form of simple acknowledgments, but a few extracts from particular letters and one or two full transcripts are given below.

Attention may be drawn particularly to the effusion from the pen of Mr. J. Ramsay Macdonald, M.P. Posing as an authority on Political Economy Mr. Macdonald displays ignorance of the customary form of address by acknowledging to Mr. Ormerod personally a letter that was signed by the sender in his capacity as Secretary, U. P. A. S. I.

Probably no higher praise could be wished for than to have such a man as Mr. MacDonald allude to the resolution as embodying "economic nonsense."

Extract from letter from Mr. J. Whitton, Secretary, Burma Chamber of Commerce, dated Rangoon, 16th March, 1911.

"In reply to your letter of the 27th January last I am to inform you that the Committee of the Chamber regret they cannot see their way to take any action in the matter referred to by you."

"Extract from letter from Mr. Alfred Bigland, M.P., dated St. James's, S. W., February 28th, 1911."

"Please accept my best thanks for your circular letter *re* Imperial Preference Tariff. The matter is one which interests me exceedingly and if at any time you have any further information to communicate I should be very glad to receive same."

"In my opinion the present time is one when every effort ought to be made to promote the furtherance of the movement."

Extract from letter from Mr. A. W. Ruthven Stuart, Private Secretary, dated 18, Bolton Gardens, S. W., 27th February, 1911.

"I am desired by Mr. Shirley Benn to thank you for your letter and for the copy of the Resolution passed at your last Annual Meeting, which has, needless to say, his entire support."

Extract from letter from Mr. Evelyn Cecil, M. P. for Aston Manor, dated Lytchett Heath, Poole, February 27, 1911.

"I have to acknowledge with many thanks the receipt of your letter of the 27th of January, enclosing me a copy of a Resolution passed at the last annual general meeting of the United Planters' Association of Southern India with reference to an Imperial Preferential Tariff. As a keen tariff reformer I have much sympathy with the views of your Association."

Extract from letter from Mr. J. Ramsay Macdonald, M. P., dated 6th March, 1911.

"I am in receipt of your very amusing resolution which I can well believe was carried *nem. con.* at the last Annual Meeting of the United Planters' Association of Southern India. When you have learnt to put national and imperial interests before those of your own pockets, you will understand the economic nonsense which is embodied in the majority of the paragraphs in your resolution, and when you have a humorist amongst you, he will amend the resolution by adding as follows :—

(j.) 'We believe in looking after ourselves and our pockets, and to that end we resolve to support any policy proposed for the increase of the price of our goods on the British market and the consequent impoverishment of British consumers.'

"At the same time I have to thank you most sincerely for your resolution. I shall certainly use it as an illustration of how so-called Imperial Preference is worked."

Extract from letter from Mr. W. J. Lumsden, dated 276 Rectory Road Gateshead, March 9th, 1911.

"Your letter in the 'Grocer's Gazette' March 4th, makes fine reading, your Association is to be congratulated on their desires for 'Imperial Unity.' Long Live the King, Lord Preserve the Empire and scatter our enemies external and internal. The colonies open their doors to us we keep ours closed to all but the cursed foreigner. Foreigners not fit to wash our feet, we are the chosen race, civilisation is impossible without us. I am making arrangements to have your letter published in the local press. My cousin Mr. J. Lumsden is Conservative Agent for this constituency of Gateshead and I am also drawing his attention to it. The north of England, Lancashire, and Scotland are the traitors, the first and last because they are pig headedly radical and Lancs., because they fear an increase in the price of raw cotton if practical "Imperialism" becomes de facto. That just strikes me I will also send your letter on to Geo. Shyvers, Tariff Reform Organiser in Manchester. So I am prepared to put my shoulder to the wheel and constitute one of those very small, perhaps, but enthusiastic patriots. Anything further I can do I am at your service, no doubt some of your people will attend the rubber exhibition in January to July this year, if so I know you will make your desires felt."

"Good Luck to our Brothers and Sisters in India."

"We will not always Ignore your Love for what will be the Grandest Empire the World has ever seen. The King, God Bless Him."

Extract from letter from the President, Sydney Chamber of Commerce, dated Sydney, N. S. W., 14th March, 1911.

"I have to own receipt of your letter of 27th January, 1911, covering copy of a Resolution which was adopted—*nem. con.*—at the last Annual Meeting of your Association, in advocacy of an Imperial Preferential Tariff, and to thank you for your courtesy in forwarding same."

"Clauses (*a*) to (*g*) might naturally be expected to emanate from your Association, but (*h*) and (*i*) are, in the opinion of my colleagues, theoretical or academic."

"At the Congress of Chambers of Commerce of the British Empire held in Sydney in 1909, the question of Preferential Trade occupied much time and attention, as you no doubt know from the printed Report of the same issued by the London Chamber of Commerce."

"When a vote was taken by Chambers, the chief Australian Chambers of Commerce—Adelaide, Freemantle, Geelong, Melbourne, and Sydney, declined to vote. The Resolution, (which by the way although carried by a large majority) had been so weakened by Amendments that it in reality amounted only to a resolution to press on various Governments 'the necessity for the appointment of Commissioners to enquire into the question as it affects each component part of the Empire, and to report to their respective Governments.'"

"The substantial majority came largely from the United Kingdom and Canadian Chambers. The temper of Commercial Australia, judging from the Congress, and from my personal observation, is far from being unanimously in favour of Imperial Preferential Trade, as with our widely distributed business it might easily lead to serious reprisals on the part of foreign nations, more particularly some of those with whom Australia does a very large export business in primary products."

"I am afraid, therefore, that I cannot hold out much hope of useful support from this part of Australia to your Association, in the way of advocating the views set out in the resolution adopted at its last Annual Meeting."

Extract from letter from the Secretary, the Montreal Board of Trade, dated Montreal, March 4, 1911.

"I beg to acknowledge receipt of yours of 27th January last and the accompanying resolution adopted by the Annual General Meeting of your Association with regard to an Imperial Preferential Tariff, and to say that same has been submitted to the Council of this Board, which was much pleased to learn therefrom that your Association was so entirely in accord with the efforts this Board has made continuously since 1892 to secure a system of preferential trade between the component parts of the Empire."

Extract from letter from the Secretary, Belleville Board of Trade, dated Belleville, March 2nd, 1911.

"I am instructed to acknowledge your letter of January 27th with enclosed resolution regarding the Imperial Preferential Tariff and the same will receive the immediate consideration of our Executive Council."

Extract from letter from Secretary, Board of Trade, City of Calgary, dated 231-8th Ave West, March 1st, 1911.

"I have much pleasure in acknowledging receipt of your favour of the 27th January having reference to a resolution adopted at your Annual General Meeting regarding the Imperial Preferential Tariff."

"I am bringing this to the attention of our Board at the earliest possible moment and will communicate further with you in this connection."

Indian Tea Association.

A "Scientific Department Quarterly Journal" is now being published at Calcutta by the above Association :

The first number contains interesting papers on the Looper Caterpillar, the Brahmaputra Alluvium of Assam, Bordeaux Mixture, and Green Manures.

The first number is free; the succeeding numbers will be charged for at the rate of 6 annas per copy.

Scientific Officer's Papers.

LX.—Report on a Tour in the Nilgiris.

Beginning on 2nd March, I made an extended tour of the Nilgiris. A detailed programme had been kindly arranged beforehand by the Honorary Secretary of the Nilgiri Planters' Association, and this I carried out. Meetings were held at Kotagiri on the 6th, Kulakamby on the 10th, Daverashola on the 19th, and Coonoor on the 25th March. These meetings were well attended, and at them matters of special local importance were discussed informally. On the 23rd March I had the pleasure of attending a meeting of the Nilgiri Planters' Association held at Ootacamund, and of delivering an address, which has already been reported in the *Planters' Chronicle* (Vol. VI, p. 172).

At the Annual Meeting of the Nilgiri Planters' Association held on 27th May, 1910, I was asked to take up the matter of the fungus which attacks the *Lecanium viride* during the wet season, with the idea of applying it to the trees in the form of a spray. In the *Planters' Chronicle* (Vol. V, p. 571) an article was published on the Control of Scale Insects in the British West Indies by means of Fungoid Parasites, in which methods for using fungi were described in detail. It was there pointed out that moisture is the most important factor influencing the growth of the fungi. I have made a study of the Nilgiri rainfall, and the following table shows the average monthly rainfall in the different districts calculated from the returns sent in to me:—

	Kulakamby.		Coonoor.	Kalhatti.	KilKotagiri.	Nellakota.
	Woodlands.	Oland.	Nonsuch.	Sophia.	—	Daverashola.
Average of	6 years.	6 years.	21 years.	23 years.	12 years.	10 years
January	4·35	4·53	4·47	0·86	5·93	0·66
February	4·64	4·27	4·90	0·39	5·99	0·29
March	1·01	1·06	4·10	0·70	2·96	0·57
April	3·40	3·49	5·97	3·72	6·83	3·01
May	4·59	4·61	3·90	5·80	5·41	5·57
June	2·31	2·35	2·87	3·82	2·16	16·03
July	2·51	2·35	3·52	3·90	2·86	24·57
August	3·85	4·43	4·81	2·80	3·84	14·55
September	3·09	2·38	6·98	4·81	7·51	7·46
October	17·73	19·67	15·55	7·45	14·12	8·19
November	11·73	11·62	11·77	3·54	10·60	3·15
December	5·79	5·39	6·86	1·70	6·11	1·24

It will be noted that there is a dry spell in the Coffee districts after November and it is then that the 'Green Bug' gets a hold upon the trees, and it is also the time which is unfavourable to the growth of the fungus. Fungi must have moisture for their development, and if used as a spray at this time of year the trees would have to be kept moist by constant spraying with water, which is out of the question from a practical point of view. During 1910 the rainfall was abnormally heavy and the fungus was enabled to grow vigorously, with the result that this year the attack of Scale has been very much lessened. The judicious use of insecticides during the dry weather, combined with the methods of control which I described in my address at Ootacamund, quoted above, is in my opinion the best way of combating this pest.

The principal enemy of Tea in the district appears to be a Mite, known locally as 'Purple Mite,' and I went into this matter in some detail during my tour. The Mite in question is *Phytoptus carinatus*, though it is possible that, at the higher elevations at any rate, other mites may also be present. The effect of the attack is to give a purplish bronze-like colour to the leaves, many of which fall off giving the bushes a thin appearance and greatly checking the flush. The under sides of the leaves, and especially the margins, are the areas most frequently attacked, but the mite will also be found on the upper surface. At this time of year the attacked areas of

leaves will be found to be thickly covered with minute white specks which are the cast skins of the insects.

The remedy is to apply Sulphur to the bushes at the very beginning of the attack. The Sulphur should be dusted on in the early morning when the bushes are wet with dew, as it then sticks more rapidly. It is most economically applied with a blower, a kind of spraying machine designed to apply powders in the form of a cloud, or it may be dusted on from perforated tins or gunny bags. From 50 to 60lbs. of Sulphur per acre are required in the case of a bad attack, and since the insect spreads very rapidly when once it begins, it is important to keep a stock of Sulphur always on the estate.

In places where the mite always occurs I am inclined to think that it would be a good plan to dust all the Tea with Sulphur in February before the attack appears as a preventative method instead of a directly curative one.

The time at which the bushes are pruned has a considerable effect upon the mite, and I have arranged for a series of experiments to be conducted to investigate this. Where an attack has been very bad prunings should be burned and the fields cleaned up as much as possible, and if Mite-infected prunings are buried, lime or Basic Slag should be sprinkled over them.

Another tea pest is popularly known as 'Flush Worm.' This is a leaf rolling caterpillar, the life history of which is at present unknown. Until this has been worked out, as a temporary measure of control the leaves attacked should be plucked and destroyed; where the attack is severe the plucking should be done every fourth day.

In my last report (*P. C.*, Vol. V, p. 272) I sounded a note of warning about Stump Rot, and pointed out that *Grevillea* stumps spread the disease in other districts and it would be well to determine whether they did so in the Nilgiris. There is no doubt that they do; during this tour I saw many cases of Stump Rot in Tea caused by *Grevillea* stumps. Now Tea is largely replacing Coffee where the latter has been killed, or badly attacked by *Lecanium viride*, and a great deal of this coffee was under *Grevillea* shade which is merely being felled, and the consequence is that in about five years time a lot of the Tea on these areas will be attacked by Stump Rot. It will undoubtedly be found in the long run that it is more economical to remove old stumps at the beginning than to fight Stump Rot in established Tea. Every Tea bush killed represents a definite loss, how big a loss I leave it to planters to determine, and in addition the disease has to be eradicated from the spot, which is a troublesome and expensive business. Finally a supply has to be raised in established Tea, which is no easy matter. I advise any one who is not convinced that it is the right policy to remove stumps to have a talk with a planter who is fighting stump rot and see what it is costing each year in made tea, labour, time, and worry, the last being by no means a negligible item. Old Coffee land should be well limed, and then forked right through, and as many stumps and dead roots of the shade trees and Coffee bushes removed as possible by means of a stump puller. Small pits for the Tea will be all that are necessary after this treatment.

The Ceará Rubber in the Kulakamby district has been tapped and some excellent biscuits made. The yield appears to be good and the experiment is most encouraging, and it justifies the planting up of this product on the lower slopes of Coffee estates and the dry regions where Tea will not thrive.

In conclusion my thanks are due to the Honorary Secretary, Mr. L. L. Porter, for the trouble he took about arranging my tour, and to the planters of the district for their kindness and open-hearted hospitality.

RUDOLPH D. ANSTEAD,
Planting Expert.

Notes and Comments by the Scientific Officer.

104. *Lantana.*—In connection with the campaign against *Lantana* which is being conducted by the Government in Coorg it is of interest to notice that this pest has been introduced into the Philippines, where it is creating some alarm. In the February number of the *Philippines Agricultural Review*, Mr. O. W. Barrett, writes of it as follows :—

" This shrub, presumably introduced from Mexico along with many other Tropical American weeds and ornamentals, has assumed, during the past two or three years, an alarming character. The seeds, carried by birds, remain viable for a considerable time and germinate whenever and wherever they find sufficient moisture, the young seedlings showing such vigor that they have little difficulty in outstripping the other weeds about them."

" This plant, which gave the Hawaiian planters so much trouble a few years ago, is very likely to repeat its record as a pest in the Island of Negros, and probably in other locations in the Philippines. The superintendent of La Granja Modelo states in a recent report : " Where there were a few scattered bushes in this part of Negros two years ago there are now thousands. At this rate it will be but a few years before all of the uncultivated land in this province will be covered."

" The attention of all landowners, where this shrub is now found, is called to this matter with the hope that they will at once attend to the eradication of the weed before it spreads beyond control. The process is simple, consisting in loosening the root system (which is fortunately very weak) by means of a pick, or even a strong wooden stake, and then chopping off the roots just below their union with the stem ; the uprooted shrubs should be thrown into a pile and burned as soon as sufficiently dry."

105. *Coffee Hybrids.*—In the Minutes of the Quarterly Meeting of the Coorg Planters' Association held at Mercara on February 27th it was recorded that : " Mr. Jackson gave some figures as to the crop he had picked from Hybrids of the 5th generation, which showed that they were capable of yielding heavy crops."

Mr. A. H. Jackson has very kindly furnished me with a copy of these figures, which those interested in Coffee Hybrids will find encouraging. He writes: " The Hybrids mentioned at the Coorg Planters' Association meeting held on the 27th February were those which you inspected the last time you were here. The aggregate yield from the five trees picked this season was 5,000 odd berries, which according to the usual calculation, is equal to a yield of 10 cwts. per acre of Coffee planted 6 x 6. Of the whole crop of 5,000 odd berries 75% were Pea Berry. The trees have not suffered in the least from their big crop ; not a single branch has died back, and they do not appear to have lost a leaf, and they look fit for a heavier crop this coming season. The Hybrids are the 5th generation counting the first cross as the first generation, the seed from it the second generation, and so on. The plants now in the nursery " (seed selected from this season's crop) " are thus the 6th generation and their yield will be the 7th."

These results, though on an admittedly small scale, are most satisfactory and encouraging, and bear out my contention that a Hybrid Coffee will give a bigger yield than Arabian and at the same time resist disease and bear its crop better. It will be remembered that the figures quoted by Mr. J. G. Hamilton (*P. C.*, Vol. V, p. 155) were somewhat similar, he obtained 1½ lbs. of parchment coffee from one tree.

RUDOLPH D. ANSTEAD,
Planting Expert.

DISTRICT PLANTERS' ASSOCIATIONS.

South Mysore Planters' Association.

Minutes of Annual General Meeting held at the Travellers' Bungalow, Saklaspur, on Monday, 20th March, 1911.

PRESENT.—Messrs. J. G. H. Crawford, President, G. Anderson, C. I. E., Hon'ble Mr. J. G. Hamilton (Planting Member of Council), Messrs. F. M. Hamilton, J. A. Harris, W. Hunt, St. J. Hunt, C. J. Hayward, P. Hunt, E. M. Playfair, E. W. Rutherford, C. K. Pittock, S. Sladden, W. L. Crawford, W. F. Scholfield, R. Thammayer and T. Anderson (Honorary Secretary). Also by proxy: J. B. Russell.

Notice convening the Meeting was read :—

SOUTH MYSORE PLANTERS' ASSOCIATION FORTY-SEVENTH ANNUAL GENERAL MEETING, MARCH, 1911.

PRESIDENT'S ADDRESS.

20th March 1911.

To the Honorary Secretary and Members of the South Mysore Planters' Association.

Gentlemen,—The year which has just closed was the forty-seventh of the existence of this Association and will ever be remembered as the one in which sorrow overshadowed the whole civilized world owing to the death of our beloved Sovereign His Most Gracious Majesty the King-Emperor Edward VII.

Cess on Coffee.—In regard to business attempted and accomplished by us during this period, the first, and on which we were unanimous, was the vote for a cess on coffee to be levied at the port of shipment by Government and to be used for the popularization of East Indian coffee generally as a wholesome and beneficial beverage. This is a move in the right direction, and I trust the Imperial Government will view it with favour.

Dasara Assembly.—Having as your representative already submitted a somewhat lengthy report, which has been published in the *Chronicle*, further reference here is unnecessary.

Laboratory for Scientific Officer and Increased Aid.—These subjects were discussed at the meeting held at Chickanhalli on the 10th and 11th November and met with general approval. In regard to increased aid, as many present could not commit their Proprietors to the eight anna acreage assessment without explanation and sanction, the matter was deferred for decision until the Annual General Meeting. It will, I fear, have to be further postponed, as definite instructions in some cases are still wanting and the Coorg Association has not agreed to fall in with us just yet and has also somewhat overestimated our acreage. Without the co-operation of Coorg and N. & S. Mysore the much to be desired increased scientific aid will, I regret to say, not be practicable, as the expense for even two Associations would be two heavy a burden to attempt.

Association Groups.—At Mr. Harris' suggestion the Association, to facilitate business, has been divided into two groups, an excellent plan which meets with general approval and is likely to work well and tend to greater interest in all matters connected with our industry.

Membership.—I regret to say there have been a couple of resignations, but I am pleased to add that Indian gentlemen are joining our Association and evincing a keen interest in it as a medium for representing the local wants of our various industries.

Police.—The I. G. P. has kindly taken steps to have the shops of suspected cardamom receivers watched; this, I trust, will tend to a diminution in petty thefts.

Hospitals—I regret to inform you that Government have decided definitely not to open a dispensary at Gonibede but are greatly increasing the size and consequent usefulness of the Saklaspur Hospital. As the buildings are at present practically no aid can be given to in-patients and the work of the present very energetic medical officer (Dr. Fernandez, is greatly restricted.

Scientific Officer.—I must take this opportunity of expressing the Association's thanks to Mr. Anstead for his work during the past year, particularly for his visit to our District and interesting lecture, which was much appreciated. It is a matter for congratulation that funds have been raised by the various Associations for the establishment of a laboratory which will facilitate the investigation and research necessary in regard to many important subjects.

Conclusion.—I must refer with regret from both a business and social point of view to the early departure of Mr. and Mrs. Harris for Home, and I am sure I shall be voicing the wishes of all in thanking Mr. Harris most heartily for the valuable work he has done for this Association and our community in general during so many years and Mrs. Harris for her unvarying kindness and hospitality. While viewing with concern the loss of Mr. Harris' advice and co-operation in all matters of moment at future meetings we can but all join in wishing him and Mrs. Harris very many years of happiness in the Old Country, where I am sure our successes or failures, and in fact everything connected with our industry, will ever be a subject of keen interest to both.

I will now place my resignation in your hands and conclude by thanking you for the honour you conferred on me by electing me as your President for the past year.

(Signed) J. G. H. CRAWFORD.

HONORARY SECRETARY'S REPORT.

20th March, 1911.

Gentlemen,—As I have only been acting as Honorary Secretary for a little over four months, and seeing that our President has already given a resumé of the year's work in his address, I do not propose to touch on any other subject than finance.

The accounts show a credit balance of Rs.603-12-2, and there is a further sum of Rs.656-9-0 due by Members, omitting the subscriptions of 2 new members who have not as yet declared their acreages for assessment.

Against this we have still to pay the U.P.A.S.I. in the current season :—

Scientific Officer Fund ...	... Rs.435	0	0	
Laboratory Fund ...	... ,, 318	12	0	
Rubber Exhibition Fund...	... ,, 5	0	0	
Planters' Benevolent Fund	... ,, 210	0	0	
or ...	... Rs.968	12	0	in all.

In accordance with instructions received at the General Meeting held at Chickanhalli on the 10th and 11th November last I have drawn up a list of the Estates represented by members with their acreages for submission to this meeting. From this you will see that our acreage at present stands at 5,562 acres under coffee and 256½ acres under Cardamoms; to this, how-

ever, must be added the acreage represented by 5 members who have not as yet sent in the revised returns called for.

During the year 9 gentlemen have joined the Association and there have been 2 resignations, so that this Association now has 38 members, 2 of whom are Indian gentlemen.

In conclusion, before placing my resignation in your hands I would wish to thank the President and members of Committee for their support and help during my term of office.

(Signed) THISELTON-ANDERSON,
Honorary Secretary.

The following new members were elected :—H. F. Anderson, S. Newcome, W. W. Moir.

Increase of Acreage Assessment.—After a general discussion and consideration of the points raised in President's address, para. 4, the following resolution proposed by Mr. J. A. Harris and seconded by Mr. F. M. Hamilton was put to the meeting and carried with a Proxy against :—"That this meeting is in favour of the acreage assessment being increased to 8 as. per acre on cultivated coffee about 5 years old, but that owing to the views of some absentee proprietors not having been ascertained no definite action can at present be taken. It is understood that 4 as. of the above assessment be earmarked as a contribution towards increasing the staff of the Scientific Officer."

The question was raised as to whether 8 annas would be sufficient to cover all the ordinary expenditure of the Association and leave sufficient balance to pay our share of Assistant Scientific Officer.

Honorary Secretary stated that our expenditure amounted to about 3½ annas an acre.

The following resolution, proposed by the Hon'ble Mr. J. G. Hamilton and seconded by Mr. T. Anderson, was put and carried unanimously—"That pending further consideration regarding the provision of an Assistant Scientific Officer, in order to consolidate all subscriptions thus avoiding frequent small demands, the subscription to South Mysore Planters' Association be raised to 4 annas per acre on cultivated coffee. This seems to cover all ordinary expenses of the association, subscription to U.P.A. and Scientific Officer Funds. This shall not affect the case of members who own no land in the District, who will continue to pay Rs.10 per annum."

Labour Agency.—Proposed by Mr. J. A. Harris and seconded by Mr. W. L. Crawford :—" This meeting do appoint delegates who shall arrange to meet others from the North Mysore Association with a view to a full discussion of this matter and should they decide in favour of the proposal to draw up a detailed scheme. That intimation by wire of this resolution be sent the N.M.P.A. to-day."—Carried unanimously.

Messrs. W. L. Crawford and F. M. Hamilton were appointed delegates.

Gonibede Dispensary.—Mr. F. M. Hamilton stated that the District Board of Kadur had no funds available for this purpose but was willing to increase local cess a small amount to obtain funds for improvement of roads and sanitation. In the event of Government sanctioning this increase, funds might be available to provide new Dispensaries, but Balur had first call.

Mr. J. A. Harris said we should insist on Dispensary being opened, and no question of funds in hands of District Board should prevent its being done.

The Hon'ble Mr. J. G. Hamilton said medical aid particularly in Mulnaad Districts was much more important than roads and communica-

tions, and proposed the following resolution, seconded by Mr. T. Anderson: "That this Association much regrets the answer given by Government regarding the Gonibede Dispensary and trusts that the Government will reconsider a decision which appears to this Association to show a lack of serious consideration of a position which is daily growing worse. That this Dispensary is only one of very many which are urgently needed and that no want of Local Funds should be allowed to interfere with the immediate provision of ample medical attendance in the Malnaad, where the village population has for years been known to be decreasing without any appreciable loss from epidemics, which are said to be responsible for decrease in other countries. That this Association desires to draw the attention of Government to the fact that, failing to obtain sufficient aid from Government for urgent needs, our District Board has asked for leave to increase local cess: it strongly urges the adoption of this method of increasing Local Fund resources in the event of the Government finding itself unable to assist by very substantial grants dedicated to the purpose of restoring the population to its normal figure with a normal annual increase."

An amendment cutting out all from "That this Association desires, &c., &c.," proposed by Mr. W. L. Crawford and seconded by Mr. J. A. Harris, was passed by 10 votes against 6.

Prevention of Thefts of Produce.—Mr. F. M. Hamilton read copy of letter from Inspector-General of Police in which he said that as there was no Act empowering him to make special provision for the detection of Cardamom thefts he could only help by suggesting that the special coffee stealing prevention constables could be instructed to watch and try to detect thefts of Cardamoms.

Mr. E. M. Playfair, on behalf of Mr. A. R. Park, spoke of specific cases and proposed the following resolution, which was carried unanimously: "I beg to move that a deputation of this Association do wait on the Inspector-General of Police, with a view to laying the facts in connection with certain cardamom stealing cases before him, and to obtain from him his opinion, as to whether something more cannot be done to check these thefts."

Mr. A. R. Park and Mr. T. Woodbridge were asked to represent matters to the Inspector-General of Police, and the Hon'ble Mr. J. G. Hamilton intimated his consent to joining them if at all possible.

Enticement away of Coolies.—Mr. F. M. Hamilton brought to the notice of meeting that a representative of a Travancore Company had enticed away with offers of higher pay a writer and his coolies from an estate in Mysore. The writer was under agreement to supply the estate with 100 coolies next season; further this agent tried to entice away the writer's son for another estate. The Honorary Secretary was instructed to write the agents of the Company concerned.

Police.—Mr. K. Thammayer brought a complaint against the police in Hassan District, and the Honorary Secretary was asked to write to the Deputy Commissioner of Hassan District on the subject.

Election of Office-bearers.—President—Mr. E. M. Playfair; Honorary Secretary—Mr. F. M. Hamilton.

Committee: Hon'ble Mr. J. G. Hamilton, Messrs. M. T. Woodbridge, J. G. H. Crawford, W. L. Crawford, C. Lake, and T. Anderson, Saklaspur group Honorary Secretary. Auditors: Messrs. E. W. Rutherford and Percy Hunt.

The Meeting closed with a vote of thanks to the Chair.

(Signed). FRANCIS M. HAMILTON,
Honorary Secretary.

Anamalai Planters' Association.

Proceedings of the 8th Annual General Meeting held at the Paralai Bungalow at 2 p.m. on February 17th, 1911.

PRESENT.—C. H. Brock (Chairman), C. R. T. Congreve, H. W. de Salis, A. C. Cotton, N. Primerose, J. O. K. Walsh, G. L. Duncan (Actg. Hony. Secretary), A. H Sharp (by proxy).

Mr. N. Primerose was elected a member of the Association.

1. Read and confirmed the proceedings of the last committee meeting.

2. *Accounts.*—The Chairman laid the accounts on the table, audited by Messrs A. C. Cotton & C. R. T. Congreve. These were passed.

Mr. de Salis proposed and Mr. Walsh seconded a hearty vote of thanks to Mr. Duncan for having come to the rescue of the Association when there was no Honorary Secretary and for having acted in this capacity for the year.

3. *Rules.*—2 (b) Proposed by Mr. Brock and seconded by Mr. Congreve :—That the subscription to the Association be raised to annas two per acre of cultivation per annum.—Carried unanimously.

14 (b) For words "Rs.10" substitute "Rs.5." 17. As the proposer of the suggested alteration to this rule was not present the matter was dropped.

4. *Roads.*—The following resolution was proposed by Mr. Congreve and seconded by Mr. Duncan and passed unanimously :—"That the attention of the Superintending Engineer be drawn to the disgraceful state into which the ghât road has been allowed to lapse, pointing out that this is chiefly due to the fact that when new metal is laid, no consolidation of any sort is done, with the result that the metal is ground to dust by the traffic almost as soon as laid.

The Honorary Secretary was also asked to write to the Executive Engineer praying that the toll charged on 4 wheeled vehicles at the toll gate at the foot of the ghat be reduced from Rs.2, as the present charge is excessive, and far higher than is charged on any other ghât road, and suggesting that the same rate as is current on the Mettupallayam-Ooty ghât be charged.

5. The letter from the Manager, the Stanmore Anamalai Estates Company, Ltd., dated 29th January, 1911, was read, and the meeting unanimously viewed with considerable surprise and regret the news that this Company intended to raise the rates for labour.

6. *Honorary Secretary.*—It was pointed out that the work entailed on the Honorary Secretary was so heavy as to make it difficult if not impossible for him to attend to it properly, and it was therefore unanimously agreed: "That the Association pay the sum of Rs.15 per month towards the cost of a clerk."

7. *Election of Office-bearers.*—The following gentlemen were elected for the present year :—Chairman, Mr. C. H. Brock ; Vice-Chairman, Mr. G. A. Marsh ; Honorary Secretary, Mr. C. R. T. Congreve.

With a vote of thanks to the Chairman the meeting closed.

(Signed) C. H. BROCK,
Chairman.

(„) C. R. T. CONGREVE,
Hon. Secretary.

RUBBER.

Rubber Smoking House.

So many persons are asking about the best structure for smoking rubber, that perhaps an account of our experiences in this direction may be of interest. I will first describe the smoking house in the Botanic Gardens, which has proved quite satisfactory and economical. The building is 55½ feet long and 19 feet wide, oblong in shape, and made of ordinary planking with a high roof. The plank walls are 8 feet high, and the roof of attap, 15 feet high in the centre. The floor is cemented with concrete below. There are two or three windows which can be opened when required and one entrance door. This building is built on a slope of about 1 in 12, and drains run down the side to carry off rain water, inside are wooden posts sunk in the ground between which run thin rattans stretched tight over which the rubber is hung. Near the door are sunk in the concrete and cement floors circular pits one foot wide and 3 feet deep in which the fire is put and then are covered with iron cones with a flat perforated top. These cones are 22 ins. high. They have a small oblong opening at the base to admit air to the fire.

The fires are made of dry old wood of some soft timber. That of *Albizzia moluccana* is found good, but any light wood will do. The wood is cut up into pieces big enough to get into the fire places, and being lit is allowed to smoulder all day. The fires are usually lit in the morning, and renewed one to 4 times a day according to the size of the fire place, one fire takes about 2 baskets measuring 2 feet deep by 1½ across of pieces of wood a day. When the cone is put on no flame is produced but abundance of smoke which soon permeates the whole building and keeps a thick atmosphere of smoke all day. The windows being closed it does not escape except by the spaces between the roof and walls or through cracks, so that none is wasted.

Three of these fire places keep the room full all day, but there are others at the upper end of the building which can be used to increase the smoke, if required, either for exceptionally heavy smoking or when the building is quite full of rubber. This house will contain 2,000 lbs. rubber sheet or more. The newest made rubber is put nearest the fires so as to get the most smoking and moved further up the slope as it gets drier. The advantage of building the house on a slope is that the smoke starting from the lowest point naturally gradually ascends to the upper end, and the surroundings are naturally drier and there is no accumulation of rain water round the building.

All smoke contains a certain proportion of water, and this and the free creosote, and naphtha are practically absorbed by the wood work and attap so that the rubber is not covered with a wet unpleasant layer. At one time we built a brick smoking room with a corrugated iron roof. In this house the fire was outside and the smoke was conducted in by a tube, but we soon found that there were deposited on the floor and elsewhere in the rooms a thick brown liquid consisting of naphtha and water. This stuff got, too, on the rubber. This mess is quite absent from the wooden drying house, though the woodwork gets dark brown or black from the deposited products of the smoke, the rubber is dry and of a good colour.

No ventilation other than the cracks is required, as any open windows let out the smoke. The entrance door is usually kept open but as it is at the lowest end, the current of air that enters drives the smoke up to the other end through the rubber. The smoke should be as dry as possible, both for the benefit of the rubber and for coolies in the smoking shed as wet white smoke containing much water is very troublesome to the breathing,

Cocoanut husk can be used instead of wood, but waste cocoanut dust and sawdust are apt to give off sparks, which being incandescent pieces of wood fly up and settle on the rubber as charcoal. Attempts to improve the smoking by adding creosote did not prove successful. For one thing it is apt to raise the temperature and produce more rapid combustion.

In one estate recently I saw an arrangement of an oven outside the smoke house connected with a passage with the interior. Here the combustion was most rapid in the inner part of the oven, while the slower combustion was going on at the outer open end, so that the best of the smoke escaped to the open air while the more rapid consumption of the fuel in the mouth of the passage increased the heat of the air passing in. Thus much smoke was lost, and a larger quantity of fuel than necessary was used.

In the Gardens smoking house no smoke escapes without having passed over some, at least, of the rubber, and much of it remains in the house nearly the whole day, so none of it is wasted. At the same time the slow smouldering does not increase the temperature, nor is there any risk from fire, as the fire is sunk in the ground in the concrete, and produces no flame. However, to avoid risks the fire can be extinguished at night fall.

It is advisable to shift the rubber from time to time in the smoke house so that it may be evenly smoked. If not moved or turned over a pale line is left where the rubber is in contact with rattan and consequently not smoked, and this spoils its appearance.

The advantages of this style of smoking house are cheapness of erection, economy of smoke, dryness and safety from fire, with complete efficiency.—*Agricultural Bulletin of the Straits and F. M. S.*

The Crude Rubber Outlook.

The outlook is that there will be an increased supply, but that it will come slowly. Of the 73,000 tons of crude rubber produced last year, 38,000 tons came from Brazil. That is, of course, all wild rubber, gathered along tributaries of the Amazon. It is estimated that only one-tenth of the possible rubber supply of Brazil has ever been tapped. If this is true, there are 400,000 tons of excellent rubber along the Amazon which could be taken out each year. But the difficulties are so great—the necessity of employing only native labour, the great expense of equipping rubber-gathering parties and the primitive methods that still obtain— that it is extremely questionable whether the supply from that quarter will materially increase for some years. In the past fifteen years the output from the Amazon has increased at the rate of about 6 per cent. a year. Undoubtedly with the increased incentive of higher prices, the production will grow more rapidly, but hardly more than 10 per cent. a year.

Over a quarter of the rubber supply, or about 18,000 tons a year, comes from Africa, but there is little likelihood of any increase from this quarter, both because of the suicidal policy of destroying the vines in order to get the rubber and because the more humane methods now employed in Congo are not likely to be as productive as the exacting, not to say, barbarous practices which are said formerly to have been in vogue. As a matter of fact, the supply from Africa decreased during the past year.

The largest increase in rubber production will undoubtedly come from the plantations in Ceylon and the Straits Settlements. This rubber has but recently become a factor in the situation. Four years ago only a few hundred tons had ever been exported from the Far East. In 1910 the exports from this region amounted to 10,000 tons. It is expected that the present year will see this increased to 15,000 tons, and men familiar with the situation in Ceylon and the Malaya Peninsula predict that there will be a further increase of 3,000 or 4,000 tons a year for the next ten years.—*India Rubber World.*

SELECTED CUTTINGS.

Government Supervision in Planting.

The general public very rarely have or can be expected to have an intelligent idea concerning the relative importance of governmental departments. If one, for instance, were to suggest to the average man that a department of agriculture could be and should be of more value to a country than any other department, the statement would be scoffed at. It takes very little explaining, however, to prove that the basic wealth of any aggregation of people comes from the ground, in fact is founded upon agricultural products in a great measure. It is, therefore, not only the privilege but the duty of a government to make its agricultural department an efficient, vital director and adviser of the agriculturist.

These thoughts are prompted by a mental survey of what the government of Great Britain has done for her colonies through her Imperial Departments of Agriculture. The striking illustration of the wonderful success of rubber planting in Ceylon and the Federated Malay States will at once occur to the reader.

It is a curious fact, however, that striking illustrations very rarely gauge even in small measure the values of such work. Were it possible to take a census of mistakes prevented—a list of costly blunders avoided—due to the research, the knowledge and the sound advice furnished planters by British Agricultural Departments the sum would be enormous.

Take, for example, our near neighbours, the West Indian Islands. The planters unguided would have covered those fertile islands with many sorts of rubber producers unsuited to climate or soil and perhaps both. With an alert, capable agricultural department, however, in the hands of men trained in such work, most of the planters were persuaded not to go heavily into any rubber producer until it had been thoroughly tried out and proved a success. This often entailed much waiting and disappointment, but it literally saved millions.

To-day the areas where *Castilloa elastica* will grow are absolutely defined. Such islands as Dominica, whose sheltered, moisture-laden valleys are suitable for the *Hevea brasiliensis* are plainly indicated because already tested. The dryer islands like Antigua, where there is a probability of successful cultivation of the *Manihot dichotoma*, are undergoing the same searching, conscientious, experimentation.

It should be remembered that rubber, to these departments, is only one item. The same careful work is put upon every agricultural product, and incidentally the broad knowledge thus gathered, particularly in relation to the many enemies to plant life, is of the greatest value to the rubber planter.

It is a curious fact but the agriculturist himself is often times the man who least appreciates the restraining influence of the specialists connected with his department of agriculture. He is very likely to look with scorn upon the man who spends precious hours in the detection of fungi or weeks in studying the life habits of some insignificant moth. He too is apt to think, that his own agricultural society or grange really knows much more about growing things than does any college product, who never has or never will run a plantation for a livelihood.

Of course, he is wholly wrong, both in his estimate of the value of the scientifically trained one and of his society. An association of farmers or rubber planters that will work with an agricultural department, criticizing, suggesting and informing is of the greatest use, not only to the department itself but to the individual members. Where the best results are obtained it will be found such a community of purpose is always present.—*India Rubber World.*

Fixation of Atmospheric Nitrogen.

Since the work of Lord Rayleigh in 1894, when he repeated the experiments of Cavendish with improved apparatus and more modern methods, continual progress has been made in connection with the oxidation of atmospheric nitrogen. Rayleigh's experiments, carried out on a large laboratory scale, showed the feasibility of obtaining nitric acid or nitrates from the atmosphere, and, given cheap power and appropriate appliances, the possibility of it being done on a paying commercial scale.

The pioneering work which followed for a long time spelt—commercially—failure. But as first one idea and then another was shown to be unsatisfactory, and had to be discarded, knowledge increased, as is always the case with research, and in 1903 Birkeland and Eyde designed and erected a plant, which, at any rate, in part solved the problem. In a lecture delivered before the German Association of Naturalists and Physicians in September last, Prof. J. Zenneck takes up the subject as that stage, and reviews this process and others which have since been devised (Leipzig: S. Hirzel, 1911). The lecture was evidently delivered to a popular audience, because Prof. Zenneck describes and illustrates the process in a way which will interest and instruct those who may have very little knowledge of chemistry. For example, by means of a model, he showed how in the Notodden process of Birkeland and Eyde the air is driven by means of a compressor through the furnace containing the disc-shaped arc, then how gases are partially cooled and the heat given up is used for the generation of steam and for evaporating the liquors. We believe, indeed, that coal is not required in the works at all for heating purposes. The Notodden plant, however, is so well known that it will be superfluous to describe it further, except to mention that very good diagrams and pictures of the works are included in the printed lecture.

Prof. Zenneck then describes the Pauling process. It is a well-known fact that vigorous blowing will put out the electric arc, consequently it is not an easy matter to blow air through an arc so that the nitrogen may become oxidised without blowing out the arc. In the process of Pauling, air is blown through an arc. The arc, however, is struck betweeen horn-shaped conductors, such as are used as lightning arrestors. The two horns are closest together near the bottom, and it is here that the arc is struck. Owing to the ascending hot air, the arc rises upwards, and is broken once for each period of the alternating current. A new arc, however, is immediately produced again at the bottom, and this goes on continuously. An air current is also driven at high speed through the electrodes, and this further elongates the flames, so that an arc of very considerable length is produced. This process is now in successful operation in Switzerland and the south of France.

Special attention is given to the interesting process of the Badische Anilin and Sodafabrik. This particular process was illustrated experimentally at the International Congress of Chemistry held in London in May, 1909. An arc is caused to form throughout a long tube, and the air is blown in tangentially. In practice, arcs of 8 metres long are employed.

Which of these three processes will best stand the test of time remains to be seen. The *sine quâ non* in all cases is, however, cheap power. In structional details each plant is being continually improved, and at present each of these processes is being commercially worked. The Paulin process is, we believe, very well adapted for the manufacture cf concentrated nitric acid, which is so important in the manufacture of explosives, and if sufficiently cheap may readily be converted into a fertiliser. The other two processes are certainly well adapted for the manufacture of fertillisers, and there is no inherent reason why nitric acid should not also be produced in all cases. —*F. M. P. in Nature.*

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Mr. A Ff. Martin's "Labour Map."

Mr. Aylmer Ff. Martin wishes it to be made known that he has received the "Labour Maps" and that they have been circulated to Honorary Secretaries of District Planters' Associations. Any surplus that may remain will be forwarded to the U. P. A. S. I. office.

A circular letter sent by Mr. Martin to the Honorary Secretaries of all District Planters' Associations reads as follows :—

"At the meeting of the United Planters' Association of Southern India held at Bangalore in the 1st week of August 1910, a Committee was appointed for enquiring into fresh sources of Labour Supply. (See pages 134 to 138 Book of Proceedings).

"To enable the Committee to begin its duties, I have prepared a Map, of which I send you two copies, one for your Association and one to be returned to me. If you will kindly shade in the parts ot the Map which correspond to the country from which your district draws its labour, it will enable the Committee to judge where fresh sources can best be sought. Also please indicate the position of the district represented by your Association. I suggest red pencil shading for the planting district and blue for the labour districts.

"I need hardly say that your views on the subject, or any information you care to give the Committee will be very welcome. In case it may be said I am seeking for this information while giving you nothing in return, I have marked roughly on one ot the maps I send you, the position of the Kanan Devan planting district marked in red, and those parts of the country on which I depend for my labour supply in blue. The scale of the map is so small it is impossible to be quite accurate; for instance I find my paint brush has swept over the Annamallay and Shevaroy hills, from where I do not recruit coolies; but the purpose of the map is sufficiently served if the country from which coolies come is *roughly* indicated.

The maps have been paid for by the U.P.A.S.I., and there are about 15 spare copies; if you require one or two of these, please apply to Mr. Ormerod, 25, South Parade, Bangalore, who will execute orders in rotation at a price which may be ascertained from him, probably not exceeding Rs.3 per copy. The map you return to me with any information you may give, and any statement of your views, will be considered confidential if desired. The 'Mamma' map showing the parts from which all the districts as a whole

draw labour, without indicating those places which supply labour to individual districts, may be exhibited at the next U.P.A.S.I. meeting, if asked for. It will almost necessarily form part of the report which the Committee may see its way to submit to the U.P.A.S.I. I trust you will have no objection to comply with my request. The fact that the present year promises so for to be an easy one to get labour at any rate in the South, should not lead any of us to put off the consideration of the subject of fresh sources of supply, which has already been left too long. It is a bit of good luck that planters have not been badly caught this year. Great delay has already occurred since the Committee was appointed, owing to the difficulties in getting the simple little map reproduced; if you will do what you can to prevent any further delay by sending in your map quickly, it will help the Committee to proceed to the consideration of this subject, the importance of which is just as great now as if the calamity of a short labour supply was already upon us. We do not hope, or wish, for a chronic state of famine in the districts on which we depend for coolies."

The "Lancet's" Analyses of Tea.

Mr. J. J. McKenzie, of Naduvatum has kindly sent a copy of a letter he has received from Dr. Hope, Scientific Officer to the Indian Tea Association, who writes:—

" The recent publication of ' The Lancet ' is a most interesting one, and the theories which are formulated therein are receiving our careful consideration.

" As part of our programme for the current year, a review of the present methods of tannin and caffeine determination in tea is being undertaken. Until really accurate analytical methods have been established, the truth of a theory such as 'The Lancet' has put forward cannot be gauged."

The International Rubber Exhibition.

A grant of Rs 500 in aid of the U. P. A. S. I. Rubber Exhibition Fund has been received from His Highness the Maha Raja of Travancore.

Imperial Preferential Tariff.

Further correspondence received on the subject of the Planters' Tariff Creed comprises the following two letters:—

From the Secretary, Auckland Chamber of Commerce, (Registered), dated Auckland, 11th March, 1911.

" I beg to acknowledge receipt of your circular letter of 27th January with copy of Resolution passed by your Association, which was submitted to my Council at its last meeting, when the following Resolution was passed—

> 'That without expressing any opinion upon the desirability or otherwise of a preference being granted on the specific articles mentioned in paras. a to g, this Chamber affirms its belief in the desirability generally of an Imperial Preference Tariff both from a sentimental and commercial aspect.'

From the Secretary, Launceston Chamber of Commerce, dated Launceston, March 14th, 1911.

" I am directed to acknowledge the receipt of your communication dated January 27th containing copy of a resolution passed at the last Annual General Meeting of your Association on the subject of an Imperial Preferential Tariff, and to state that in all probability the matter will come up for discussion at the Annual Meeting of the Associated Chambers of Commerce of the Commonwealth of Australia to be held in Adelaide beginning on May 9th."

Scientific Officer's Papers.

LXI.—The Effect of Nitrate of Soda upon the flow of Ceara Latex.

In Bulletin No. 19 of the Hawaii Experiment Station, Mr. E. V. Wilcox, the Special Agent in charge of the Experiment Station, published the following account of some experiments he had conducted to determine the effect of Nitrate of Soda on the flow of Ceará Latex.

"While fertilisers have been used in rubber plantations for increasing the growth and vigour of rubber trees, we have found no record of experiments to determine the possibility of increasing the flow of latex temporarily during the tapping period. It is apparent that if the flow can be considerably increased by the application of a quick-acting fertilizer, economy will be secured in the operations of tapping and collecting latex. The first experiment with Nitrate of Soda was carried out at Keanae, Maui, on Ceará rubber trees averaging 14 inches in circumference. A uniform series of trees was found and divided into three groups which received ½-lb., ¼-lb., and no Nitrate of Soda respectively. Before applying the Nitrate of Soda, the yield of the whole group of trees was tested by means of uniform tapping. The weight of dry rubber from three trees which received ½-lb. of nitrate of soda each was 2. 3 oz; from three trees which received ¼-lb. of nitrate of soda 1. 3 oz., and from the three unfertilised trees 1. 2 oz. The nitrate of soda was placed in the soil at a depth of 3 or 4 inches and at some distance from the trunk, around each tree, where it would most quickly become available to the roots. The weather was rainy during the experiment, which extended over a period of about two weeks, and the nitrate of soda was therefore rapidly dissolved and utilised by the tree, or washed away in the drainage water. The effect of the nitrate of soda upon the flow of latex was manifested within forty-eight hours.

"The matter of the influence of nitrate of soda upon the flow of latex was considered sufficiently important to be put to a further test on rubber trees near the station office. These trees were about 11 in. in circumference From one group of five trees 0. 9 oz. of dry rubber was obtained in three days, before applying the nitrate of soda, and 1. 3 oz. from the same trees in the three days following the application of the fertilizer. In this case each tree received ½-lb. nitrate of soda. On another group of five trees the yield of rubber during the three days before the nitrate of soda was applied was 0. 9 oz., and during the three days following its application 1. 2 oz. "It appears, from these experiments, that the flow of latex may be temporarily stimulated by applying nitrate of soda. It now remains for the planters to determine the exact economy of the method by applying it on a large scale as soon as rubber trees become mature."

At the end of last year it was decided to try a similar experiment with Ceará Rubber in Coorg, and Mr. G. L. Newbery has carried out a preliminary trial at Chickenhully Estate.

The results obtained cannot be considered very conclusive, but they indicate that the flow of latex and yield of rubber is increased by the application of Nitrate of Soda, and they justify a further trial on a larger scale. During the coming tapping season, therefore, a larger series of field experiments will be conducted at Chickenhully, the results of which will be reported in due course. In the meanwhile the results so far obtained are published as a working report merely to show what has been done, and it is hoped that others interested in Ceará cultivation will conduct duplicate experiments.

The experiments at Chickenhully were carried out under Mr. Newbery's supervision, and all the measurements were made by him personally both in the field and the factory. My thanks are due to him for the most enthusiastic way in which he has carried out my suggestions, and the following account of the operations has been compiled with his assistance, and the results discussed in consultation with him.

In December 1910, 18 Ceará trees, five years old, having the same girth at three feet from the ground, *viz*, 26 inches, were selected. These trees each gave the same yield, each having an equal number of lateral cuts of the same depth.

Special care was taken about this so as to make the trees strictly comparable, and throughout the tapping operations each tree received an equal number of lateral cuts of *the same depth*. This latter point is of vital importance if comparable yields are to be obtained.

The trees were divided into three series of six uniform trees each :

Series I received 1 lb. of Nitrate of Soda per tree.
Series II received ½-lb. of Nitrate of Soda per tree.
Series III received nothing.

A space two feet in width and four feet from the stem of each tree in each series was lightly dug up on one side of each tree, and the Nitrate of Soda was then applied, dug in, and watered with a nursery can, using four cans of water to each tree, the unmanured series being also watered to the same extent. The weather was very dry.

Tapping began on the 16 December, one week after the application of the Nitrate of Soda, and the results are shown in the subjoined table. Probably a week was too long a period to leave before the first tapping, and an interval of two or three days would have been better. It has been noticed that there is a very pronounced increase of latex flow about two days after the application of the Nitrate of Soda.

Tapping was continued until each series of trees gave an equal yield, showing that the effect of the Nitrate of Soda had ceased. The last four tappings, on January 13th, 16th, 20th, and 24th, gave the same quantity of wet rolled rubber for each series, and these yields have been eliminated from the table of results as not being due to Nitrate of Soda.

Weight of Wet Rolled Rubber.

Date of Tapping.		Series I 1 lb. of Nitrate of Soda.		Series II ½ lb. of Nitrate of Soda.		Series III. nil.		Temperature at 7 a.m.
		oz.	drs.	oz.	drs.	oz.	drs.	
Decr.	16 ...	1	8	2	2	...	15	
,,	20 ...	2	8	2	10	1	14	
,,	24 ...	1	9	2	1	1	8	52
,,	28 ...	1	8	1	12	1	4	53
,,	31 ...	1	4	1	8	1	1	50
Jany.	4 ...	...	15	1	0	...	14	65
,,	7 ...	1	10	1	12	1	6	54
,,	10 ...	1	4	1	5	1	2	65
Total ...		12	2	14	2	10	0	...
Total Dry Rubber ...		5	12	6	8	5	1	...

The result appears to be that $\frac{1}{2}$-lb. of Nitrate of Soda per tree is the best quantity to apply, and this increased the yield of wet rubber from 1 ounce $10\frac{2}{3}$ drs. to 2 ounces $5\frac{2}{3}$ drs. per tree in eight tappings, and the yield of dry rubber by 5 drs. per tree in the same time. As will be seen from the report quoted at the beginning of this paper, Mr. Wilcox obtained an increase of 2. 72 drs. of dry rubber per tree.

A second experiment was conducted with the same trees, in which another dose of Nitrate of Soda similar in quantity was applied to them, but all round the trees. Tapping was begun again on the 1st February, but no comparable results could be obtained and the yields were very variable, due doubtless to the dry weather and the fact that the trees had begun to winter. Before the different series had settled do·vn to normal again it was decided to stop tapping, and the results of the second experiment are practically valueless.

In conclusion Mr. Newbery says: " Personally I am by no means satisfied and I think that further work should be done before any decision as to manuring with nitrate of soda is come to. The Ceará tree is so erratic in yield that I am forced to this conclusion." I quite agree with this conclusion, but I think that the results are sufficiently encouraging to warrant a more extended trial next season.

RUDOLPH D. ANSTEAD,
Planting Expert.

CHINESE TEA TRADE.

The American Consul, at Hong Kong, Mr. G. E. Anderson, reports that Chinese tea exporters expect an unusually good season in the export trade of 1911. Any notable increase in world's demand will be felt directly in China, whence most of the additional supply will come, he says: China is by so great a margin the largest producer of tea in the world, the amount produced for its own consumption being the greatest thing of the sort in the world, that it naturally becomes the world's great reserve supply in case of any extraordinary demand. A material increase in the price of tea in the world's markets would release all the tea the world will need for some time to come. Tea authorities in Europe seem to agree that a limitation in the world's supply is likely to be felt this year.

U. S. A. TEA STANDARDS AND TEA REGULATIONS.

After an unusually prolonged conference, extending over several days, the United States Board of Tea Experts, on February 10, concluded their labours and announced the new standards as adopted by the Board and recommended to the Secretary of the Treasury as follows:—

No. 1. Formosa Oolong.	7. Japan pan fired.
No. 2. Foochow Oolong.	8. Japan basket fired.
No. 3. Congou.	9. Japan dust or fannings.
No. 4. India	10. Caper.
No. 5. Gunpowder Gree.	11. Scented Canton.
No. 6. Young Hyson Green.	12. Canton Oolong.

From this table it will be noted that all coloured teas are eliminated. There is said, however, to be a vast amount of confusion in the minds of the general run of tea dealers—wholesale and retail grocers, retail tea dealers, and others—as to the concurrent operation of these standards and the " artificially coloured " regulation going into effect May 1, 1911.

Notes and Comments by the Scientific Officer.

106. *Fuel Trees.*—It is hoped that the following information, which has been compiled from various sources, and the popular descriptions will enable planters to recognise the two trees recommended by the Forest Department as being suitable for planting to yield a quick return of fuel and charcoal. (See *P. C.*, Vol. VI, p. 140).

"Calophyllum Inophyllum."—The Alexandrian Laurel, or Pinnay Oil tree, is a middle sized tree or shrub, with smooth stems and leaves, the buds only being covered with minute rusty hairs. The leaves are entire, and elliptical in shape, the blades being 4 to 8 inches long and the leaf stalks ½ to 1 inch long. The flowers are strongly scented, white, and about an inch in diameter. They are produced in branched bunches springing from the axils of the leaves, each flower being shortly stalked; and they are often used for temple decoration and offerings. The fruits are yellow and about an inch in diameter. Cameron gives the following vernacular names for this tree: Kan. "Surahonne;" Tam. "Pinnay;" and this author thus describes it:—"Usually found as a small evergreen tree, but in some parts of the Malnad it attains considerable size. Wood reddish-brown, close grained, and moderately durable, occasionally used for building and for agricultural implements; it also burns well." Speaking of the cultivation of this tree, Cameron says, "Being a sub-maritine species it attains its best development near the sea, or where sea breezes will exercise their influence upon it. Seed germinates freely, especially when the drupe is fractured, and there is no difficulty in raising stock. In inland situations a little coarse salt added to the soil does good. Plant 20 feet apart."

"Cullenia excelsa."—A small tree with soft wood which is not very durable. The young shoots are covered with scales as are also the under sides of the leaves and the outer portions of the flower. The leaves are narrowly oblong, smooth above, the under surface being covered with silvery or orange coloured scales. The flowers occur in large clusters on the old wood. The fruit is 4 to 5 inches long and densely covered with long prickles; it opens into 3 to 5 valves and contains a few shining brown, hard coated, seeds, about 1⅓ inches long, each nearly covered by a white fleshy covering known as an 'arillus.'

Cameron makes no mention of this tree, but Brandis describes it, and gives the Tamil name as 'Vedupla,' and the Malayalam name as 'Karayami;' the Tamil name at the Coimbatore Forest Museum is given as 'Malai Konji.'

107. *Coffea robusta.*—In a paper read before the Royal Colonial Institute, comparing the Malay States, Java, and Ceylon as plantation and residential colonies, Mr. John Ferguson, C.M.G., mentioned the success which had recently attended the growing of *Coffea robusta.*

In the discussion which took place after the paper, Mr. R. N. G. Bingley, who has lived in Java for nearly twenty years, said: "One word as regards the reference to the proposed extension of cultivation of *robusta* Coffee in the Malay States. This is a matter which requires very careful consideration beforehand. Robusta Coffee has been a very fine thing in Java and is so still; but it must be remembered the Dutch planters imported *selected* seed and plants of this and other equally good varieties from the countries where they were indigenous, and have taken good care to secure and use only the best seed ever since. If, however, a big demand from other countries for this seed commences, the natural result will be the export of a lot of seed which does not fulfil the conditions of selection which have hitherto existed, and you may be sure it will not be the Java planters who will come off second best."

RUDOLPH D. ANSTEAD, *Planting Expert.*

DISTRICT PLANTERS' ASSOCIATIONS.

South Travancore Planters' Association.

Proceedings of a General Meeting held at Quilon Club on Saturday, 24th March, 1911.

PRESENT.—Messrs. D. G. Cameron, L. G. Knight, Chas. Brander, Chas. Hall, H. W. Heberden and A. W. Leslie (Honorary Secretary).

Visitors :—Messrs. T. H. Cameron and W. Clare.

Mr. D. G. Cameron presiding. The Minutes of last meeting were taken as read.

Proposed by Mr. D. G. Cameron and seconded by Mr. C. Brander, that Mr. J. Stewart be asked to act as Chairman for the current year.

International Rubber Exhibition.—Read circulars from Secretary, U. P. A. S. I., and Mr. J. A. Richardson. The Honorary Secretary was instructed to write all Members asking for their exhibits, &c., to be sent in without further delay.

Indian Tea Cess Committee.—Mr. C. E. Abbott's name was suggested as a permanent representative of the U.P.A.S.I. for this Committee.

Green Tea Bonus.—The Honorary Secretary to write and thank Mr. Jackson, on behalf of the Association, for his efforts to secure the Bonus on Green Tea.

Travancore Legislative Council.—Mr. D. G. Cameron was congratulated on having been offered and accepted the seat in Council recently vacated by Mr. J. A. Richardson, who is going Home.

Papers on Table.—Report of Agricultural Department; U. P. A. S. I. Circulars, *re* Thefts of Produce and Mysore Exhibition.

(Signed) A. W. LESLIE,
Hon. Secretary.

Nilgiri Planters' Association.

At a meeting of the Nilgiri Planters' Association held at the Collector's Office the following members were present :—Mr. J. H. Pascoe in the chair, Messrs. S. P. S. Rice, Travers-Phillips, L. L. Porter, R. Stanes, A. M. Brodie, G. Oakes, C. Gray, W. Rowson, S. Cox, A. W. Antram, T. Brown, S. Clarke, R. L. C. Gompertz, T. J. J. Kenna, A. S. Dandison, E. Hardy, W. A. Cherry, A. K. W. Downing, J. J. McKenzie, P. A. Thompson, H. L. Andrews, and the Scientific Officer.

NON-SERVICE OF WARRANTS.

With reference to a letter from Mr. J. H. Wapshare, asking that the system of hand-service of warrants by Maistries which had been superseded by a system of sending warrants direct to the police for service may be reverted to, was first discussed. A very interesting letter from the Collector, to the effect that the change introduced had received the sanction of Government and the approbation of the High Court and therefore if any radical change was desired cogent reasons would have to be given for such alterations, was read.

Mr. Rice's letter went very fully into the matter and showed that matters though not improved by the change were, as far as could be judged, no worse. After much discussion the following resolution, proposed by Mr. Porter and seconded by Mr. Clarke, was unanimously carried :—

(1) "That Government be asked to issue orders that the service of warrants under the Planters' Labour Act sent from planting districts should be specially controlled by the various Inspectors and District Superintendent of Police concerned and that a special register showing the stages of disposal of these warrants should be opened and carefully examined.

(2) "That the Government be asked to use their influence with the Mysore Durbar to take similar action and to make it effectual.

MR. ANSTEAD'S ADDRESS.

Mr. Anstead delivered a very interesting address, which has already appeared in the *Planters' Chronicle.*

THE ASSISTANT SCIENTIFIC OFFICER.

Mr. Pascoe said that he personally considered that this matter was a most important one, since the time had come for Planters to decide whether or not Scientific advice was worth paying for, for matters had reached a stage when they had got quite beyond Mr. Anstead's power to cope with them, considering that he had practically the whole of S. India under his charge. If Scientific advice was worth having, and he for one decidedly believed it was, they must try to obtain an assistant specially for the district. Mr. C. H. Browne's proposal was that planting districts in S. India should be grouped, each group having its own Assistant Scientific Officer working under Mr. Anstead's directions, and to obtain this it was well worth the 6 annas per acre to the U. P. A. S. I. (plus 2 annas to local Association) which he understood was the sum that would be required on the basis of the present acreages. He urged upon those present that they should seriously consider the matter and give at this meeting a decided expression of opinion as to whether they were in favour of Mr. C. H Browne's proposal.

An extract was read from a speech recently made by the Chairman of the Indian Tea Association showing the steady rise in outturn of Indian Tea since the inception of the Scientific Department 10 years ago, and the important improvements in manufacture now generally adopted, enabling producers to improve materially the quality of their tea.

A lengthy discussion ensued, and on being put to the vote the following resolution was unanimously carried :—

"That in order to provide the funds necessary to secure scientific assistance, to contribute a suitable subscription to the U. P. A. S. I. and to carry on the work of this Association, the assessment payable by members shall be raised to 8 annas per acre on all cultivated land, whether Coffee, Tea, Rubber, Pepper, Cardamons or any other product, subject to confirmation at the annual general meeting to be called in May next."

PURCHASES OF SULPHUR FOR BLIGHTS.

The Collector drew attention to the large purchases of sulphur one year and the very small amount returned as used. It was explained that sulphur was used for destruction of blights and that if it was not delivered in time to tackle these, it would be held in stock till need arose to use it, which if blights were not serious might be some considerable time. It was very important that stock should be held so that application could be made at the very first appearance of the pests.

RAILWAY RATES.

In this connection Mr. Porter pointed out that he had addressed the Railway authorities with a view to obtaining lower rates for tea and that the Railway was willing to give them a reduction if the Association could give some idea of what amount of tea would pass over particular lines. It was also pointed out that the Railway might be addressed in connection with rates for manure. Mr. McKenzie suggested that special manure trains might be run at particular seasons of the year. The Honorary Secretary invited planters to send him figures as to what amount of tea and manure each individual estate would have sent over the Railway line and that he would have it put before the Railway authorities with a view to a concession rate *being obtained.*

COFFEE.

Extracts from a Lecture.

In the course of a lecture on "Coffee," delivered at Bournemouth recently by Mr. Allan Cooper, F.G.I., a good deal was said that is of interest to planters.

Of the early history of Coffee—the eating of it which led up to the drinking of the infusion—little need be said.

ROASTING.

Mr. Cooper remarked :—History does not relate who was the genius who first roasted coffee. Remember that coffee is eaten by Arabs in a raw state, pulverised and mixed with fats, and is also by them made into soup. Coffee contains ingredients of high food value, and it is more stimulating if taken raw because it then centains pure caffeine. The most valuable ingredient of coffee is caffeine. Caffeine is chemically identical with theine extracted from tea and theobromine extracted from cocoa. Upon the presence of this caffeine the stimulating properties of coffee depend. Unfortunately part of this is lost in the process of roasting, the intense heat drawing it away. This caffeine acts as a stimulant to the heart's action ; it accelerates respiration and increases brain activity. Next there is caffeic acid, which is of a slightly astringent nature. This is considerably reduced by roasting, because a large part of it is converted by the roasting process into a substance called "caffeon." Upon this caffeon depends the delicious aroma and flavour so characteristic of roasting coffee. If the coffee is not sufficiently roasted this flavour is not properly developed, and the liquid has an insipid, woody character : while, if it is overroasted this caffeon is partially dissipated into the air, and the fine flavour is lost. The oils and facts in coffee undergo a chemical change in roasting. A learned chemist some years ago asserted that roasting increased the quantity of these oils ; but this is incorrect.

There is practically the same percentage of oil in both raw and roasted coffee. The acticn of roasting is to dispel the gases which are confind in the berry. The expausion of these gases causes the cells which contain the oil to burst, so that it can be more readily extracted when roasted, but it does not increase the quantity. Roasting is also necessary to enable the berry to be easily ground. Pulverising the raw berry is difficult work. Moreover, making coffee, as we do as a beverage, with boiling water, over 40 per cent. roasted berry is soluble, whereas 25 per cent. only of raw berry is soluble in boiling water. You will then see how important the process of roasting is, and how exceedingly necessary it is that it should be properly carried out. To roast coffee properly intelligent supervision is necessary. But, given a man of ordinary intelligence, who will use his power of observation and keep his eyes and nostrils open coffee roasting presents no insurmountable obstacles. The difficulties of roasting have, in my opinion, been greatly over-estimated. To hear some men talk one would imagine that coffee-roasting is a difficult art, to which but one in a thousand could attain. The desire to keep a firm hold on a man's trade may have been partly instrumental in fostering this.

EXAGGERATED IDEA OF THE DIFFICULTIES.

Self-interest is one of the most forcible factors in deciding human actions and moulding human opinion. But I feel convinced that this is a mistaken policy, even from a selfish point of view, because my experience convinces me that the grocer who roasts his own coffee invariably increases his coffee trade. It cannot be too persistently urged upon retailers to sell freshly roasted coffee, and only freshly roasted coffee. The importance of this cannot be overestimated. People do not willingly consume foods which

have been cooked over a month. Why then should they be expected to buy coffee roasted for such a long period? Unfortunately, the British public seem unaware of the very valuable properties that coffee possesses. Why is coffee drunk? Apart from its palatable nature it is a brain tonic, giving increased mental activity, enabling the brain to continue working for a longer period than it otherwise would do, without the reaction which follows the use of alcoholic stimulants. Indeed, coffee is considered a direct antidote to alcohol, and big coffee drinkers are usually small consumers of alcohol. A cup of strong black coffee sometimes acts as a counter-stimulant to the initial stages of intoxication.

THE USE OF COFFEE

has declined in England in recent years. Why is this? Partly, I believe, from the lower cost of its rival, tea. A pound of tea will make considerably more liquid refreshment than a pound of coffee. So, no doubt, some of this decrease can be attributed to the score of economy. There is, I think, another important factor, and that is the large additions of chicory so frequently sold. Coffee Drinkers—that is, your true and inveterate coffee drinkers—always drink pure coffee. People say they cannot drink coffee, it disagrees with them. No doubt there are some affected in this way; but I believe that more often than not it is the chicory which disagrees with them. Chicory acts on the liver and is in the nature of an aperient, and with some people produces headache. Coffee dispels headache, providing the caffeine has not been removed. Remember that every bit of chicory added reduces the percentage of caffeine in the cup, and so reduces its stimulating properties. If you can get people to know and get thoroughly accustomed to the taste of pure coffee, properly made, and not the miserable coloured water that so often masquerades as coffee, they will not return to the compound misamed "French" coffee. Others have told me that pure coffee is not so palatable as coffee and chicory. I think otherwise. Again, I have heard the random statement that "coffee alone is absolutely unpalatable." In reply to this I would ask, how is it that coffee was drunk in this country during a period of 150 years before people started mixing it with chicory? Pure coffee, properly made from properly roasted and freshly ground beans, is one of the most palatable drinks of modern civilization.

Dear Coffee and Reduced Consumption.

The consumption of coffee in this country during 1910 was 198 tons smaller than in the previous year, and during the first two months of 1911 the deliveries were 143 tons less than in the same period of 1910. It is held that the higher prices which have been ruling for more than six months are in a large measure responsible for the falling off in consumption, which is reflected in other countries besides the United Kingdom. The considerable rise in quotations is naturally resisted by buyers who have worked their stocks down to the narrowest limits but, despite the continued unsettled condition of the speculative market which has restricted business, the trade has recently been compelled to operate more freely in order to replenish their holdings, and thus prices at the public sales have acquired more steadiness than in February. Little change can be expected in values of the finer kinds of coffee, as the quality of the small East India crop is chiefly poor, while the Costa Rica crop is below the earlier estimates.—*The Grocer.*

A New York report also tells of diminution of demand, as a result of high prices.

And it should be remembered that the Brazilian Government are making strenuous endeavours to *stimulate consumption*—side by side with their endeavours in the direction of valorization!

RUBBER.

Systematic Tapping on Estates.

There are, says the *India-Rubber Journal*, many indications that the experience gained during the past three years on mature Hevea plantations has been of considerable value in eliminating many faulty practices and establishing others which seem likely to have a long life. Economy in bark removal stands out as a feature, and though we are glad to be able to congratulate planters on the thinness of the bark parings, we look forward to still further improvement when coolies become more familiar with their work.

NUMBER OF TAPPING CUTS PER INCH.

The number of cuts per inch is often an index of the amount of supervision given to the tapping coolies. The larger the number of cuts per inch, the less detrimental will be the effect of tapping on the tree, and the larger the yield of rubber per unit of excised bark, presuming, of course, that the parings are always sufficiently thick to permit of an issue of latex. The various tapping knives now on the market vie with one another in their ability, when skilfully used, of cutting away bark of the minimum thickness. The actual thickness of the bark on young and old trees, and its texture, is said to determine to some extent the minimum thickness of each paring.

Malcolm Cumming states that in tapping ten-year-old trees for the first time, only 10 to 12 cuts per inch can be made: Parkinson affirms that it is not possible to get so many cuts on renewed bark as on trees newly tapped. It is said, nevertheless, by Gallagher, that more cuts to the inch can be made on the soft bark of young trees than on the hard bark of older trees tapped for the first time.

The thickness of the parings varies by about 100 per cent., the minimum being 1-30th of an inch, and the maximum about 1-15th of an inch, the former is reported in the F. M. S. and the latter in Ceylon. Experience has shown that a better yield is obtained with 20 cuts than with 15 to the inch. Anything less than 26 cuts to the inch denotes, according to Gallagher, faulty management; 23 is considered an average, and 25 and over as very good. This does not include the first incision, the width of which varies according to the knife and the amount of skill used.

DISTANCE BETWEEN TAPPING LINES.

Where tapping is done on the four-year-system on four sides of the tree, it is often convenient to have the tapping lines twelve inches apart in order that, at the rate of one inch per month, each section can be made to last one year. If the trees are tapped on alternate days throughout the whole year, and the average thickness of bark excised at each tapping is about 1-25th of an inch, the system is almost ideal. In parts of Malaya, however, the strip of bark removed in each tapping operation is usually much thinner than 1-15th of an inch, varying generally from 1-20th to 1-30th of an inch. Furthermore, during certain months, work cannot proceed regularly, on account of holidays, bad weather, etc.; this affects the average total width of bark excised each month. It is therefore necessary for each planter to adopt a distance between tapping lines according to the general system on which he is working the estate. If he is tapping one-quarter section only for each of four years on alternate days, working 25 days in the month, and his bark shavings are 1-15th of an inch thick, the tapping lines should be 10 inches apart to last one year. If the thickness of the bark removed is 1-20th or 1-30th of an inch, the distance should be about 7½ and 5 inches apart respectively, a spacing which is obviously too

close. If daily tapping is adopted, then the distance should be doubled. It is generally better to make the tapping lines too far apart rather than too close together.

If the system adopted is the two opposite quarters to last two years, and the opposite sides are tapped on alternate days, (each tree being tapped each day, but on opposite sides), then the distance of the tapping lines should, if the shavings are 1-15th, 1-20th, or 1-25th of an inch in thickness be 20, 15 and 12 inches apart respectively. It is, therefore, seen that allowing: (1) for only an average of 25 working days per month, (2) bark shavings 1-25th of an inch thick, and (3) alternate day tapping, using two opposite quarters to last two years, the original distance of 12 inches between tapping lines suggested by me still stands good. The distance must, of course, be increased if the working days per month or the thickness of the bark daily excised are increased beyond those specified. If the number of tapping days for the planned period is divided by the thickness of the bark shavings, the quotient is the distance to be allowed between the tapping lines. The following table will perhaps prove useful to planters planning out their tapping operations :—

24 WORKING DAYS EACH MONTH.

Distance between tapping lines.

Average thickness in inches of bark shavings.	For Daily tapping to last.		For Tapping on alternate days.	
	1 Year.	2 Years.	1 Year.	2 Years.
	ins.	ins.	ins.	ins.
1/10	$28\frac{4}{5}$	$57\frac{3}{5}$	$14\frac{2}{5}$	$28\frac{4}{5}$
1/15	$19\frac{1}{5}$	$38\frac{2}{5}$	$9\frac{3}{5}$	$19\frac{1}{5}$
1/20	$14\frac{2}{5}$	$28\frac{4}{5}$	$7\frac{1}{5}$	$14\frac{2}{5}$
1/25	$11\frac{13}{25}$	$23\frac{1}{25}$	$5\frac{19}{25}$	$11\frac{13}{25}$
1/30	$9\frac{3}{5}$	$19\frac{1}{5}$	$4\frac{4}{5}$	$9\frac{3}{5}$
	25 WORKING DAYS EACH MONTH.			
1/10	30	60	15	30
1/15	20	40	10	20
1/20	15	30	$7\frac{1}{2}$	15
1/25	12	24	6	12
1/30	10	20	5	10
	26 WORKING DAYS EACH MONTH.			
1/10	$31\frac{1}{5}$	$62\frac{2}{5}$	$15\frac{3}{5}$	$31\frac{1}{5}$
1/15	$20\frac{4}{5}$	$41\frac{3}{5}$	$10\frac{2}{5}$	$20\frac{4}{5}$
1/20	$15\frac{3}{5}$	$31\frac{1}{5}$	$7\frac{4}{5}$	$15\frac{3}{5}$
1/25	$12\frac{12}{25}$	$24\frac{24}{25}$	$6\frac{6}{25}$	$12\frac{12}{25}$
1/30	$10\frac{2}{5}$	$20\frac{4}{5}$	$5\frac{1}{5}$	$10\frac{2}{5}$
	27 WORKING DAYS EACH MONTH.			
1/10	$32\frac{2}{5}$	$64\frac{4}{5}$	$16\frac{1}{5}$	$32\frac{2}{5}$
1/15	$21\frac{3}{5}$	$43\frac{1}{5}$	$10\frac{4}{5}$	$21\frac{3}{5}$
1/20	$16\frac{1}{5}$	$32\frac{2}{5}$	$8\frac{1}{10}$	$16\frac{1}{5}$
1/25	$12\frac{24}{25}$	$25\frac{23}{25}$	$6\frac{12}{25}$	$12\frac{24}{25}$
1/30	$10\frac{4}{5}$	$21\frac{3}{5}$	$5\frac{2}{5}$	$10\frac{4}{5}$
	28 WORKING DAYS EACH MONTH.			
1/10	$33\frac{3}{5}$	$67\frac{1}{5}$	$16\frac{4}{5}$	$33\frac{3}{5}$
1/15	$22\frac{1}{5}$	$44\frac{4}{5}$	$11\frac{1}{5}$	$22\frac{2}{5}$
1/20	$16\frac{4}{5}$	$33\frac{3}{5}$	$8\frac{2}{5}$	$16\frac{4}{5}$
1/25	$13\frac{11}{25}$	$26\frac{22}{25}$	$6\frac{18}{25}$	$13\frac{11}{25}$
1/30	$11\frac{1}{5}$	$22\frac{2}{5}$	$5\frac{3}{5}$	$11\frac{1}{5}$

	29 WORKING DAYS EACH MONTH.			
1/10	$34\frac{4}{5}$	$69\frac{3}{5}$	$17\frac{2}{5}$	$34\frac{4}{5}$
1/15	$23\frac{1}{5}$	$46\frac{2}{5}$	$11\frac{3}{5}$	$23\frac{1}{5}$
1/20	$17\frac{2}{5}$	$34\frac{4}{5}$	$8\frac{7}{10}$	$17\frac{2}{5}$
1/25	$13\frac{23}{25}$	$27\frac{21}{25}$	$6\frac{24}{25}$	$13\frac{23}{25}$
1/30	$11\frac{3}{5}$	$23\frac{1}{5}$	$5\frac{4}{5}$	$11\frac{3}{5}$
	30 WORKING DAYS EACH MONTH.			
1/10	36	72	18	36
1/15	24	48	12	24
1/20	18	36	9	18
1/25	$14\frac{2}{5}$	$28\frac{4}{5}$	$7\frac{1}{5}$	$14\frac{2}{5}$
1/30	12	24	6	12

General Estate Systems of Tapping.

Whatever system of tapping is adopted, I think it is essential that the same areas should be regularly tapped, and not one side or part of it be allowed to rest for one or more months and then be retapped. Where tapping every alternate day is carried out, the coolie removes a very thin piece of bark, and gets a reasonable flow of latex. If tapping is commenced on a given area after one or two more months' rest, the first few tappings give very little latex, a quantity of bark and also valuable labour being thereby wasted. Of course, where the tree, through some cause or other, does not yield latex in proper quantity or of the required quality, a rest must be given. Such a procedure is, fortunately, not often necessary.

THREE-YEAR-SYSTEM.

The main principle underlying modern tapping operations is the interval of time allowed for secondary bark to mature before being retapped. In some countries three years are allowed, but in most a four-year interval is regarded as much safer. When the three-year-system is adopted, the tree is marked out into thirds, and one part is tapped each year. This is a system which has been approved by some directors and planters in Malaya. Adherents to this system generally believe in tapping every day, and in having the tapping lines nine inches apart; trees 16 inches in girth having two, trees 18 inches having four, and trees 20 inches as many as six cuts on each tapping area.

FOUR-YEAR-SYSTEM OF TAPPING.

In May, 1908, my system of tapping was drawn up for, and adopted by, a large estate in Province Wellesley :—

1. The tapping lines should be about 12 inches apart, and sloping at an angle of approximately 45 degrees.

2. The half-herringbone system, or, in the case of smaller trees, basal Y or V to be adopted.

3. Tapping to be done on each side every alternate day (each tree being, therefore, tapped daily).

4. The renewed bark to be four years old before being tapped.

(A.) Trees 15 to 18 inches girth.

Tap only the basal foot on half the tree. This should be done only where the trees have a vigorous appearance, and are over three years old.

(B.) Trees 18 to 20 inches girth.

Divide the tappable section into north, south, east, and west. Tap to a height of 3 feet on the half-herringbone system on two opposite quarter sections, these two quarter sections to last two years.

(C.) Trees 20 to 24 inches girth.

Tap up to 4 feet only in the same manner as B.

This system, if properly carried out, will not unduly tax the trees. It will give a gradual increase of yield from the beginning, and will permit of an interval of at least four years for the renewed bark to mature.

When the trees are above 24 inches, the tapping area should be raised to 5 feet, the same system, *i.e.*, four quarter-sections, being adopted. The girths referred to above are those at a yard from the ground. As each tree increases in girth and passes from one class to the other, additional tapping lines are added.

This quarter-section system has since been adopted by some planters in Selangor, and on estates with which I have some connection in Sumatra, Borneo, and Java, and has been approved by independent experts in Malaya. On some estates where the tapping lines are 18 inches apart and the trees are tapped daily, trees with a girth of 15 inches may have one cut, and 18 inch. trees two cuts.

Fitting, at a later date, advised that the tapping system to be recommended is the division of the bark in to four quarter-sections, on the herring-bone system, each to be tapped for one year, the whole of the bark to last four years. He states that Ridley confirms the adoption of the system.

Gallagher favours the quarter-secrion system of tapping (half-herring-bone), as he believes bark renewal and flow of latex will be better from this than from any other system in vogue. He prefers tapping one quarter for one year only, instead of two opposite quarters for two years. The following is the system he outlined :—On young trees, measuring 18 to 20 inches at a yard from the ground, put on a basal V 18 Inches high, and tap every day. This will last one year. The second year, put a similar V on the other side. The third year begin the one-quarter-in-one-year system on either of the first two quarters tapped, and put on cuts as high as the girth allows, taking the opposite quarter the fourth year. His reasons for departing from the one-quarter-in-one-year system are : (1) In trees 5 to 6 years old which have had only one cut upon them, the renewed bark in two years is thick enough to be tapped ; (2) the cuts are short, and the distance which building material must move transversely is not so great as in later years ; (3) the cut on one quarter is too short, and the bark is too thin higher up.

Alternate and Daily Tapping in Malay.

Tapping every alternate day or every day appear to be the two frequencies adopted in Malay ; some records indicate a better yield from tapping every alternate day, others show very little difference over a period of many months. Campbell (" Malay Mail," May 3rd, 1910) stated that as a result of numerous experiments he had found that over a period of six months tapping on alternate days gave the best results in the first three months, but during the second three months' tapping every day gave the bigger yield. An independent authority, after carrying out a lengthy research in Malay, states that in his opinion the alternate day system is better for a variety of reasons.

Tapping Experiments at Buitenzorg.

The Hevea rubber trees at Buitenzorg, Java, though some of them were planted on the 16th July, 1877, are not remarkable for their size owing to the trees having been grown on an old rice field and in association with other products. The eight-year-old trees only measured 3 to 3½ feet in girth ; much better growth has been obtained on planted estates.

Many tapping experiments were being made in 1908 to determine the best frequency for tapping and intervals of rest. Many of the trees were tapped every alternate day for nine months, the pricker immediately following the parer on every occasion during that period. The whole of the bark between the parallel tapping lines, orginally twelve inches apart, had at the time of my visit been used up. The yield from the eight-year-old trees was 650 grams per tree per annum. This is quite satisfactory when the tapping area each year is only over one-quarter of the basal area.

Light Entering Packing and Curing Rooms.

Referring to the amount of light which is allowed to enter not only packing, but curing rooms, the *India-Rubber Journal* observes :—

"On many estates it has been found advisable to have the windows made of red glass in order to keep in check chemical changes consequent on exposure of rubber to light. This permits of samples of rubber being inspected and prevents undesirable changes in the rubber.

"The use of red glass for all factory departments will probably be more extended in time to come. This may do considerable good where rubbers are collected which are very apt to become sticky or tacky on exposure to light. Vine and Castilloa rubbers are usually rich in resins, and are more liable to become sticky than Hevea."

Rubber Planting Industry in Uganda.

The Acting Governor of the Protectorate at Uganda, reporting for the year 1909-10, states that the exports of rubber were the highest on record. The total quantity of rubber exported was 47 tons. Of this quantity 36 tons were shipped by Mabira Forest (Uganda) Rubber Co., Ltd. Their rubber is chiefly obtained from the West African rubber tree (*Funtumia elastica*), and it compares favourably with the best Pará rubber. Another company has been formed to work another large tract of land, and negotiations for other forest areas are going on.

A survey of the Mabira Forest was, at the request of the company, taken over by the Government. This survey was commenced in June, 1909, and is now complete. The total area surveyed was 273½ square miles. The greater portion of the work stated in last year's report to have been completed by the Mabira Company's surveyors had to be done over again, as native estates were not demarcated by them.

The Pará rubber tsees in the Botanic Gardens at Entebbe continue to make most satisfactory growth, and tapping experiments show that the prospects of Pará rubber cultivation are most encouraging. The growth of *Funtumia elastica* trees is slow when compared with that of Pará. The results of an experimental tapping of a 6½ year-old tree indicate that they are not of a tappable size at this age. The Castilloa rubber tree grows well, but it is very subject to the attacks of a borer (*Inesida leprosa*, Fab.), which does very great damage to the trees, and accordingly it must be considered of little economic importance to the Protectorate. *Manihot glaziovii*, Muell Arg., grows very rapidly, and an experiment with tapping this tree during the year has given very good results. *Manihot dichotoma* and *Manihot piauhyensis* have been introduced through the kindness of the Director, Royal Botanic Gardens, Kew, and of these the former has made exceedingly rapid growth, and a few trees will be of a tappable size in another year.

As in previous years, the crop of cocoa seeds produced in the Botanic Gardens has been utilised for seed purposes. The cocoa fly (*Ceratitis punctata*) did considerable damage to the crop this year. The larvae of

this insect feed on the pulp which surrounds the seeds, and thus prevent the development of the seeds.

The average rainfall for the last ten years at Entebbe is 57·82 inches. The heaviest rainfall of the year occured at Mbarara, where 80·06 was recorded as having fallen in 105 days. The mean daily sunshine at Entebbe was 6 hrs. 48 mins., and the average hourly velocity of the wind for the year was 2·1 miles, the prevailing direction being from S. W. to S.

The following figures, which are the actual cost per acre of the Government Cocoa Plantations at Kampala, will serve as a clue to the cost of cultivation in Uganda. Superintendence is not included in the figures. Clearing 24 acres, Rs.15·04; weeding 24 acres, Rs.22·23; holing and lining, 24 acres, Rs.2·07; planting cocoa, Rs.2·65; planting plantains, 0·97; total cost per acre, Rs.42·96—*India-Rubber Journal.*

New Process for Coagulating "Castilloa."

Mr. William F. Dern writes from Mexico to the Editor of the *India Rubber World*:—"In June, 1910, I obtained in Mexico a patent for the chemical working of crude rubber, and built, in company with Mr. Karl Schweickhard, General Manager of the local house of Harburger and Stack, a New York firm, the very first factory for the development of this process; we have been working seven months with good results. Already, in spite of the tremendous increase in the price of crude rubber in the last year, which for a while made the buying up of the latex impossible for us—we have shipped about 3,000 kilograms to the German market, for which we received an average price of 13 marks (=about $1·40 gold) per kilogram, and for the gum resin, which is a by-product of the process, we were paid 7 marks (=about 75½ cents) per kilogram. You will therefore see that the product of this process realizes a notably better price than the Mexican scrap.

The operation of my process is as follows: The latex, which is bought up from agents in the plantations, is thoroughly cleaned in the wire sieve, the preserving powder prepared by me is stirred in, and then it is poured into cans, which are soldered up, and these are then ready for transport to the factory. Often-times these arrive in the factory only after 20 days' time or more, yet in good fluid condition, since the powder prevents the coagulation of the latex. Once in the factory, the latex is poured into great wooden containers and mixed with a substance which decomposes the resin and organic substances, in order to bring about more easily the separation of the same in the working in the engines. We possess here five rotary engines, which work the latex, and we have fifteen others in process of installation.

"After the latex has for a certain time undergone in the wooden containers the influence of the chemical products, the rotary engines are filled with a gallon of latex, two litres of the compound necessary for the working added to it, the motor set in motion, and the engines operate with about 500 revolutions. After 20 minutes—often somewhat more—the rubber is ready. The pieces of rubber are then washed and pressed in the washing presses, then dried, and inside of 24 hours are ready to be shipped. The product left in the engines is passed through a cloth filter and is in a few days dry, when it is pressed, and is the so-called gum resin.

With such an outfit as we have, we can manufacture up to 600 pounds of rubber a day; that is, when we shall have the above—mentioned 15 rotary engines in operation; say, inside of a month. The expense of this process amounts to 5 cents, gold, per gallon of latex; the yield on an average is 32 per cent. of rubber, without the gum resin, which amounts to about 6 per cent."

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THE U. P. A. S. I.

(INCORPORATED.)

The U. P. A. S. I. Exhibition.

One District Planters' Association has samples of Coffee in readiness. Honorary Secretaries of all Associations are requested to kindly try to arouse interest in this matter and arrange for collection of samples in their respective districts.

Mr. C. H. Brock has very kindly promised to come down to Bangalore a few days before the Annual Meeting and to take charge of the work of arranging the Exhibits. It is to be hoped that these will be of a character to warrant this heavy call being made on Mr. Brock's good nature. Exhibits of produce, of rubber-tapping knives, or of anything directly connected with the raising or preparation of Estate crops, will be very welcome. They should be sent to the U.P.A.S.I. Office.

"Planters' Papers."

On the eve of his departure for England Mr. J. A. Harris enlisted as a contributor to the "Planters' Papers" series. He chose *the* subject of the day, and what he has to say about it will be found in another part of the current issue.

If other planters would follow this example the interest of the paper to its planter readers would be greatly enhanced. It is very desirable also that the contents of such papers should be made the subject of public discussion, so that not one side alone of any particular topic may be presented. Hitherto the items of the "Planters' Papers" series might be likened to "Angels' Visits." They could easily be made one of the most useful features of the *Chronicle*, as the section in which they would come offers an excellent opportunity for friendly yet serious "debate" concerning unsettled points and matters of interest to the whole planting community.

"The Planters' Library."

"Soil and Plant Sanitation," by Mr. H. Hamel Smith, and Messrs. Stuart R. Cope's and A. Constant's English translation of Dr. J. S. Cramer's work on "The Cultivation of Hevea" have now come to hand. Neither of them can, however, be passed through the hands of the reviewer in time for notice in to-day's number. A mere acknowledgment of receipt must suffice for the present, except for one other remark, which is, that to Trinidad (*little* Trinidad) no less than 700 copies of the second of the two books mentioned are stated to have been supplied already! It will be interesting to note, later, the extent of demand in South India—a much more important planting centre than Trinidad can claim to be.

Dinner at Saklaspur to Mr. & Mrs. Harris.

After the Annual General Meeting of the S. M. P. A. at Saklaspur on 20th March, the members and their friends met at the Munzerabad Club at a dinner given in honour of Mr. and Mrs. Harris, who have since left the District. There were 29 present, *viz*: Mr. J. G. H. Crawford, President, Mr. Graham Anderson, C.I.E., the Hon'ble Mr. J. G. Hamilton, Mr. and Mrs. Wetherall (Hassan) Mrs. Anderson, Mr. Thiselton Anderson, Mr. and Mrs. Playfair, Mr. and Mrs. F. M. Hamilton, Mr. & Mrs. Green Price, Miss Barclay, Miss Horsley, Mr. Loftus Crawford, Mr. Rutherford, Mr. Sladden, Mr. Pittock, Capt. Foster, Mr. Hayward, Mr. Percy Hunt, Mr. St. John Hunt, Mr. Vivian Hunt, Mr. Scholfield, Mr. Taylor, and Revd. J. Redmond. Three or four ladies who had hoped to be there were prevented by illness from attending.

The room looked very well and the tables were prettily decorated with Pagoda flowers and maidenhair.

Mr. Wecksler, of Bangalore, who earlier in the day had photographed the members attending the meeting that Mr. Harris might receive a copy as a memento, took a couple of flashlight photographs of the assembly at dinner.

After an excellent dinner had been enjoyed Mr. J. G. H. Crawford, as President of the Association, proposed "The King-Emperor." This having been drunk, Mr. Graham Anderson, C.I.E., was called upon to propose the health of Mr. and Mrs. Harris; and in doing so he said:

"Ladies and Gentlemen,—Although in the past my brother planters have generously bestowed many honours upon me, I desire to assure you that my inner consciousness has never made me feel a greater sense of my unworthiness than to-night, when through the kind and self-denying courtesy of Mr. John Crawford, the President of our Association, and our recognised leader, I have been called upon to propose the next toast.

"I feel greatly re-assured and encouraged by the knowledge that, however imperfectly I may perform the pleasurable duty I have been entrusted with, it cannot in any way interfere with the certainty of the toast being received with appropriate enthusiasm.

"We are here to-night to do honour to Mr. and Mrs. Harris, who are about to leave for the dear Homeland after many years' residence in this District.

"We, one and all, have a great admiration for Mr. and Mrs. Harris and will deeply regret the blank which will occur in our small but united community.

"Mrs. Harris has been the personification of kindness to us all, and Mr. Harris has been a pillar of strength to our Association—being a passed master in debate, a trusty guide and counsellor, and an adept in the skilled and diplomatic arrangement of all difficult subjects or negotiations with which our Association has had to deal.

"His clear judgment and advice have indeed been invaluable to us and have not only been highly appreciated by our local community but have been fully recognised by the members of the United Planters' Association of Southern India, who, by appointing him their Chairman, paid him a well-merited honour which we have every reason to be proud of.

"That the voyage to England may be in every way enjoyable is our most sincere wish, and that every blessing, happiness, and good fortune may accompany Mr. and Mrs. Harris wherever they may go is our heartfelt desire; and in the same way that they will be remembered by us with esteem

and affectionate regard, we feel sure they will carry away with them many happy recollections of their residence in this District and will continue to take the same kindly interest in us and our industry as they have hitherto always evinced.

"I ask you to drink to the long life, happiness and prosperity of Mr. and Mrs. Harris."

Mr. Harris, in an excellent speech, thanked the members. His response commenced with the remark that that was the proudest moment of his life. He gave an eloquent assurance of his most grateful appreciation of the honour which had been conferred on him and Mrs. Harris, an honour which he regarded as the greatest which he had ever received and which he could never forget. He expressed his unfeigned gratification that any services which he had performed for the Association with such pleasure to himself had been so kindly appreciated and dwelt on the sorrow he experienced in having to leave the District in which he had spent the happiest days of his life and had made so many friends. He felt, however, that he was not altogether leaving the District and his friends there, as he would remain a member of the S. M. P. A. and take interest in all its affairs.

He paid a most graceful compliment to the senior members of the Association, who for many years had given so willingly their services to the planting community and impressed upon the younger members his fullest confidence that they would worthily assume the mantle of those who had striven so continuously to maintain the traditions and usefulness of the Association. They had good examples before them, notably Mr. Robert Anderson, the oldest planter in the district; Mr. Graham Anderson, whose knowledge and experience had been ever at the disposal of the Association; and the Hon'ble Mr. J. G. Hamilton, who was always ready to help and work in any way he could.

He would like to see North and South Mysore represented by one Association, with several groups.

He thanked Mr. Graham Anderson for the remarks made about his wife. Only he could know what she had been to him.

In conclusion, Mr. Harris wished the Association every possible success, and its members ever increasing prosperity and in bidding them farewell he assured them that wherever he and Mrs. Harris were they could never forget their many friends in the Planting Districts or fail to maintain an affectionate and abiding interest in everything connected with their happiness and welfare.

The Hon'ble Mr. J. G. Hamilton (P. M.) then rose and in the name of friends in the District presented Mrs. Harris with a gold bracelet set with precious stones as a small remembrance of the affectionate regard in which she and her husband were held by all who knew them.

Mr. Harris on behalf of his wife having thanked all present a very successful evening was brought to a close at a late hour.

"The Soy Bean in India."

In a circular of the Indian Tea Association, Calcutta, dated the 10th instant, it is remarked:—

"Dr. G. D. Hope, the Association's Chief Scientific Officer, has brought to the notice of the General Committee a publication by Mr. David Hooper, F. C. S., entitled 'The Soy Bean in India.' This pamphlet gives an account of the various races of the soy bean, their uses and method of planting; and it will be, Dr. Hope believes, of interest to those who make use of this legumenous crop as a green manure.

"The pamphlet is on sale at Messrs. Thacker, Spink & Co., and Messrs. W. Newman & Co., Calcutta. Its price is 2 annas per copy."

Notes and Comments by the Scientific Officer.

108. *Germination of Tephrosia Seed.*—Much has been published in the *Planters' Chronicle* about *Tephrosia* seed, and it was stated that its germination was unsatisfactory, and a method of treatment with Sulphuric Acid was recommended and described in Scientific Officer's paper No. XLIX (Vol. V, p. 610). I have since discovered, however, that, as stated in the *Chronicle* (Vol. VI, p. 169), in the hill districts the germination appears to be quite satisfactory and that there is no need to treat the seed before sowing it. Should anyone find any difficulty in germinating the seed, Mr. Cecil Wood, the Principal of the Agricultural College and Research Institute, Coimbatore, has discovered a method of treatment which is much more simple than the Sulphuric Acid one, and he has very kindly forwarded me the information. He gives the seed a slight grinding with some dry sand in a mortar mill and thereby gets 'splendid germination.' Mr. Wood remarks that his mill is driven by an engine, but he has no doubt the ordinary circular mortar mill would do just as well.

There should now be no difficulty whatever about growing Tephrosia as a green dressing; seed is available in quantity, and it germinates with ease, or can easily be made to do so. As a cover crop it is excellent, and I advise planters generally to give it a thorough trial during the next few years. Analyses of the plant published in a Progress Report of the Ceylon Agricultural Society show that the twigs, leaves and pods contain 2·24% of Nitrogen, and that the Ash contains 28% of Lime, 11·96% of Potash and 16% of Phosphoric Acid. The Nitrogen is obtained from the Air and is a gain to the soil and the permanent crop grown on it, and most of the mineral contents of the ash are drawn from soil depths which are unoccupied by the roots of the permanent crop. When Nitrogen is bought as Poonac it costs about Rs.12 per unit, the cost per unit being determined by dividing the price of the fertilizer per ton by the figure representing the percentage of Nitrogen in it. When bought as Nitrate of Soda the Nitrogen costs about Rs.14 per unit. Every unit of Nitrogen obtained by means of a Leguminous green dressing costs nothing at all.

109. *Distribution of Fungus Spores.*—It is sometimes asked how it is that fungoid diseases, like *Corticium javanicum* for instance, are able to spread so quickly and over such large areas. A. H. R. Buller, in a recent book on 'Researches on Fungi,' when dealing with spore formation, states that in a fruit of *Agarisus campestris*, the mushroom, there were estimated to be 1,800,000,000 spores which were dispersed at the rate of 40,000,000 per hour. In another fungus, *Coprinus comatus*, there were estimatad to be 5,240,000,000 spores which fell at the rate of 100,000,000 per hour. The most productive of all is the giant Puffball, *Lycoperdon giganteum*; in a fruit whose dimensions were 40 cm. x 28 cm. x 20 cm. there were estimated to be seven trillion spores.

These figures, which seem almost incredible, indicate how it is that fungoid diseases spread so fast, and how important it is when dealing with their control, to adopt methods which kill the fungus before it reaches the fruiting and spore-bearing stage.

Buller points out that the advantage to the plant of having so many spores is evident when it is realised that in the case of *Polyporus squamosus* for example, it is estimated that only about one spore in a million is able to develop into a plant. In the case of a fungus which attacks a cultivated plant the chances of the spores finding a suitable situation on which to develop are, however, many times increased.

RUDOLPH D. ANSTEAD, *Planting Expert.*

PLANTERS' PAPERS.

The 8-Anna Assessment.

Even in these days when the U. P. A. S. I. has been in existence for 17 years, and has to most minds proved itself worthy to live, one still hears the question asked: "What has the U. P. A. S. I. ever done for us?" It is easy to answer this now, for, apart from any other achievements, it has given us our Scientific Officer. Previous to his appointment we had the benefit of Dr. Lehmann's services, and these also were placed at our disposal mainly through the instrumentality of the U. P. A. But though the former Agricultural Chemist in Mysore was most capable and though he gave us most valuable help and advice, he never really had a chance as far as we were concerned, his energies and abilities having been diverted all too soon into other channels.

Now we have got a man to ourselves, a whole time man, what chance are we going to give him? We have been exceedingly fortunate in the selection of our man. Mr. Anstead is not only equipped with the knowledge and training necessary to carry on the work we have put in his hands, but he has had considerable experience of similar work in the tropics. Over and above these qualifications he has a remarkably keen mind, and an untiring energy. It looks, then, as if we planters in South India had got our chance. We have been groping in the dark for years, we have been following any one who would lead, and have floundered into all sorts of dark and unprofitable places. Dr. Lehmann held up a light and tried to rescue us; but circumstances were too strong for him, and he was not permitted to enlighten us as he might have done. Now we have got a light steadfastly shining—a light which has already reached some of the darkest places, and which, given time and opportunity, will undoubtedly penetrate further and further. Are we going to give it the chance?

This is a question which should not be lightly answered—the prosperity of our various industries may depend on the nature of our reply. Let us then weigh this matter carefully and endeavour to ascertain whether from the practicable point of view we are likely to get a *quid pro quo*, whether the small amount we are asked to subscribe towards the Sc. O. Scheme is likely to yield a reasonable rate of interest.

It has been obvious from the first to any thinking mind that the Sc. O. could not single-handed adequately cope with the work and that some development of the Scheme must ensue. A brief consideration of the work will suffice to convince anyone of this. In the first place, remember the huge area over which it extends, 2nd, the various industries which it includes, 3rd, the different climates which exist in altitudes varying from 8,000 ft. to sea-level with corresponding variations of temperature. From the physical point of view it is impossible for one man to *continue* covering this area, and to be subject to the varying decrees of temperature, and from the mental point of view it is impossible for one man to investigate the different pests and diseases, and the many other points on which we require enlightenment in connection with our several industries. The outcome then must be an extension of the Scheme—the gradual establishment of a department.

It will be necessary to go slow in effecting this development, as there are many difficulties in the way, none of which, however, should be insuperable. The fact of the U. P. A. S. I. representing so many industries and covering so large an area undoubtedly stands foremost, but the proposal which is now under discussion, *viz.*, that certain groups of districts should combine and provide themselves with special assistants to work under

the Sc. O. offers a feasible solution of this difficulty. The crux of the whole matter is funds. To revert to the simile used above, we cannot keep the light burning without oil, and now we are being asked not only to maintain the original light—but also some two or three lesser ones. The proposal is that in place of the present cumbersome and somewhas uncertain system of raising funds there should be a consolidated rate of 8 as. per cultivated acre. From the various discussions which have taken place it is not quite clear what this 8-anna assessment is supposed to cover, and I think it would serve to enlighten the planting public if a concise statement were published showing the estimated cost of the proposed Schemes and what proportion of the 8 annas they would require.

For the sake of argument, I will assume that the Sc. O. Scheme will require the whole of the 8 annas, that is to say, that planters instead of the voluntary amount which they have hitherto been subscribing will be asked to pay a fixed 8 annas per acre assessment. It is desirable to briefly consider what are the objects of this assessment, what benefits are likely to accrue, and what proportion it bears to expenditure. We planters have started this Sc. O. Scheme, we put our hands in our pockets, we have enlisted the sympathy of the various governments, and with their assistance we have got our man. We foresaw that if the scheme fizzed there must be development and that more funds would be required. If, then, we are satisfied with the progress that has been made we are committed to carrying on the Scheme, and if we are to be regarded as a body of intelligent and logical men we *must* go on with it.

I think most people will agree that our Sc. O. has more than fulfilled the hopes we formed of him. We could not expect that in the short time he has been with us he should have achieved any great scientific results. We all know that Science moves very slowly, and that results can only be obtained after years of experiment. He has, however, already rendered us very great assistance, and in some cases saved our pockets very considerably. In proof of this his discovery of Bordeaux Mixture as a probable cure for Pink disease may be instanced. Then, he has initiated experiments in connection with Hybridisation of Coffee, with manures, &c., which in the future may have far-reaching results. Further, he has given us invaluable advice regarding diseases and pests which may save us large sums and in some cases obviate absolute disaster.

I assume, then, that the Sc. O. Scheme has been fully justified and that we have already derived considerable benefits from it and that in the future there is every prospect of these being added to. We are logically, therefore, bound to go on, and from a practical point of view there is surely no difficulty that may not be got over.

Let us consider a property of, say, 500 acres which annually expends Rs.50,000. This property would be asked to pay Rs.250 and what would there be on the other side of the account? There would be all the benefits that we are at present deriving from the Sc. O. which would be greatly increased owing to the fact that, having assistants, he would be able to give a little more time to Laboratory work, and there would be an assistant to the Sc. O. living in the neighbourhood, working under his guidance, observing local conditions, investigating pests, and making a study of manurial requirements. The item on the expenditure side seems paltry in comparison with what we should get for it. The cure for a pest which might be discovered might save us thousands of Rupees; advice regarding manures and cultivation might do likewise. What we are asked to contribute is only ½% on our expenditure. Most of us would think nothing of spending this amount

on a new gun, or double the amount on a horse. Are we going to grudge it when it may mean the difference between a thriving industry and a struggling one, between prosperity and the reverse? We have got our opportunity—we have got one man, we have got the sympathy of Government—the rest depends on ourselves. If we refuse this support the Scheme will collapse, we may even lose our Sc. O., and revert once more to the old, unsatisfactory position of affairs. If we rise to the occasion, and I believe this will be the case, Government will see we are in earnest, and will doubtless reappoint the Sc. O. for a further period at the expiry of his first term, about three years hence.

J. A. HARRIS.

[Mr. Harris' suggestion regarding issue of a concise statement showing the estimated cost of the proposed scheme is under the consideration of the Chairman, who will probably calculate on a 6 anna per acre cess payable to the U. P. A. S. I., so that the remaining 2 annas of the gross 8 anna cess may be available for the expenses of the respective District Planters' Associations.

Apropos of Mr. Harris' other remarks, the following is quoted from the *India-Rubber Journal* of February 25, 1911 :—

"There can be no question that the manufacturing and planting sections of our industry demand the application of scientific principles if progress is to be continuously recorded. Manufacturers have hitherto drawn upon various sources for their scientific officers, and their experience has been such as to lead to a preference being given to certain institutions. The planting community have usually selected men fresh from the university to fill the scientific posts; only recently has there been an attempt made to draw upon men with some technical training for the posts of managers and assistants. Mr. R. Blair, M.A., B. Sc., recently read a very instructive paper on this subject before the Sheffield meeting of the British Association."

Scientific Officers for Plantations.

"There is, he said, least difficulty in showing that the products of the agricultural colleges have found posts in agriculture or in allied industries. The case of agriculture may be somewhat exceptional. There has been so much development in this industry in recent years that there was bound to be a considerable demand for trained men. Moreover, many of the young men who have undergone a course of training in agriculture have done so in order to fit themselves for farming, or otherwise dealing with land as land agents or farm managers on their own account. Further, it has, for a fair number of years now, been obvious that study in the agricultural colleges had to be combined with practice on the farm. The agricultural colleges also report that there is a considerable demand for their students in various branches of foreign and colonial land development work, such as tea, coffee, cotton, and rubber planting, management and extension of irrigation colonies, forestry, stock farming, and so on. A certain number of students trained at agricultural colleges are in demand for commercial undertakings in business associated with agriculture. For example, the German Potash Syndicate has a number of men representing its interests in various parts of the world who were educated at one of the oldest agricultural colleges, and the Permanent Nitrate Committee and the Sulphate of Ammonia Committee have also appointed agents or representatives who have gone through a similar course of training."]

DISTRICT PLANTERS' ASSOCIATIONS.

Mundakayam Rubber Planters' Association.

Minutes of a General Meeting held at Mundakayam (Rani Estate) Bungalow on 1st April, 1911.

PRESENT.—Messrs. G. Atkins, A. C. Vincent, R. Harley, G. H. Danvers Davy, E. R. Gudgeon, W. F. Meumann, Reid, W. A. Asher, A. Hamond, E. E. Eyre, Housan, J. J. Murphy (Chairman), and F. H. Hall, (Honorary Secretary).

The Minutes of the last meeting were confirmed.

The Honorary Secretary then read the minutes of a Committee Meeting held at Yendayar Bungalow on the 7th of February, which were confirmed.

Roads. Lalam-Eruttapettah.—The Honorary Secretary was asked to write and thank Government for their letter No. 305 of 23rd February 1911 and to add that the Association hope that the work will be started at once and finished before the monsoon breaks. Also to ask Government to grant a further sum should the amount promised not be sufficient for the necessary repairs.

Kadamonkolam-Kuppakayam.—The Honorary Secretary was requested to send a reminder to Government.

Post Office.—The Honorary Secretary was requested to write and ask the Superintendent of Post Offices when the office is to be removed from the 33rd to the 35th mile, as the premises at the latter place cannot be kept vacant indefinitely.

The Chairman said that the Durbar had given the Telegraph Authorities permission to open an office at Eruttapettah, and that he hoped this would soon be done.

Customs Duty.—Honorary Secretary was instructed to write and ask for a reply to the Chairman's letter of the 10th of March with reference to the detention of rubber cases at Arukutty. Read letter from Messrs. Peirce, Leslie & Co., Ltd., on the same subject. The Chairman said that he had written thanking Messrs. Peirce, Leslie & Co. for their prompt action in the matter.

Rubber Exhibition.—Read letter from Messrs. Peirce, Leslie & Co., Ltd. As the time for shipment of exhibits cannot be extended, it is not probable that any rubber will be sent for competition.

Doctor Scheme.—The guarantee deed was circulated for the members' approval.

Scientific Officer Scheme.—The Chairman regretted that he and Mr. Vincent had been unable to arrange a meeting with the representatives of the M. C. P. A. before this, but he hoped a meeting would be possible early in this month.

Annual Subscriptions.—The Honorary Secretary was instructed to call in the Annual Subscriptions to the Association at the rate of 10 cents per cultivated acre.

Mr. Asher thanked the Association for all they had done with regard to the Lalam-Eruttapettah road and the Eruttapettah Telegraph Office.

The next meeting will be held at Yendayar Bungalow on the first Saturday in July.

With a vote of thanks to the Chair the meeting terminated.

(Signed) J. J. MURPHY, *Chairman.*

(„) FRED. H. HALL, *Hon. Secretary.*

Central Travancore Planters' Association.

Minutes of the First Quarterly Meeting of the above Association held at Caradygoody Bungalow, on Saturday the 8th April, 1911.

PRESENT.—Messrs. W. H. G. Leahy (Chairman), F. Bissett, T. A. Vernon, J. F. Fraser, W. Haslam (visitor), C. W. Lacey, J. H. Cantlay, T. A. Kinmond, W. A. J. Milner, A. R. St. George, J. S. Wilkie, and H. C. Westaway (Honorary Secretary).

The notice calling the meeting was read.

The minutes of the previous meeting were taken as read and confirmed.

Correspondence.—Read letters *re* detention of tea and rubber chests at Arukutty for claim of export duty on planks.

Resolved: "that this Association write to Government with reference to their letter to Messrs. Peirce, Leslie & Co., asking them to let the Association know, as soon as possible, their decision in the matter, and that the export duty on worked timber including planks, does not include tea chests, and further point out that as all the chests are imported free for packing tea and rubber, it appears to be out of order that an export duty should be collected on the same chests going out of Travancore."

Read letters from the Secretary, United Planters' Association of Southern India, from Nos. 8/11 to 21/11.

Read letter from Scientific Officer dated 28/2/11.

Read letters from Chief Secretary to Government No. 416 dated 23/1/11 and No. 1450 dated 3/2/11.

Read letters from the Superintendent, Devicolom Division, No. 249 of 2/2/11, No. 2 of 4/2/11 and No. 801 of 16/3/11.

Doctor Scheme.—Read letter from Honorary Secretary, Mundakayam Rubber Planters' Association, dated 28/1/11.

It was resolved "that the Honorary Secretary of the Medical Fund cable to Messrs. Rowe, White & Co., for a reply to his letter, enquiring what progress had been made *re* choosing a Doctor."

District Roads.—Read letters from the Sub-Division Officer No. 22 of 21/1/11, No. 21 of 21/1/11, No. 42 of 3/2/11, No. 73 of 2/3/11, and No. 95 of 27/3/11.

Read letters from the Chief Engineer No. 212 of 3/2/11, and No. 238 of 7/2/11.

Bridge at the 2nd Mile, Cardamom Hill Road.—Resolved: "that the Honorary Secretary do send copies of the correspondence to the Dewan, and the British Resident, pointing out the utmost urgency of this work being completed as soon as possible, before the South-West monsoon, as if not completed by then half the District stand to be cut off from supplies for 6 months."—Carried unanimously.

Labour Rates.—This was discussed at length, when it was resolved: "that Messrs. McArthur, Bissett, and the Chairman, be appointed to revise these, as resolved in committee."—Carried unanimously.

Legislative Council Member.—As Mr. Cameron had been appointed by Government, nothing further was done.

Proposed by Mr. Kinmond and seconded by Mr. Bissett: "that this Association do apply to Government asking them to place a Veterinary Hospital at Aruday." Carried by a majority of 12.

The Chairman explained that the Honorary Secretary wished to resign, as he was going Home. A hearty vote of thanks for his services was accorded to the Honorary Secretary.

On a ballot being taken Mr. Wilkie was elected.

With a vote of thanks to the Chair the meeting terminated.

(Signed) H. C. WESTAWAY, *Hon. Secretary.*

RUBBER.

The Brazilian Syndicate.

A telegram to the *Frankfurt Gazette* mentions the formation of the Brazilian Rubber Syndicate, and states that up to the present it has taken off the market 3,500 tons of rubber.

The telegram further asserts that the syndicate has a drawing credit in London up to £2,000,000. The Banco do Brasil is stated to have advanced 14 contos. Eight thousand tons of rubber is named as the length to which the syndicate is prepared to go.

The Cost of Laying Out a Rubber Estate.

The *Rubber World* (London) continues to give its weekly readers useful information on the planting, as well as on the financial side of the rubber-producing world. Among other items of interest Mr. Wicherley's articles on "The Whole Art of Rubber Planting" continue to attract general attention. The following, taken from a recent issue, gives a very good idea of the information these articles contain. Speaking of planting up an estate, Mr. Wicherley says:—

"The preliminary work of marking off the various fields—which should average 40 acres each, inclusive of paths—detaching the areas which are to provide wind belts, and selecting the sites for cart roads, bungalows, factory, stores, &c., must be done before the clearing contractors are permitted on the guidance of all concerned. In Ceylon, India and the Straits Settlements contracts for this kind of labour may be readily placed with the certainty of getting the work done well and expeditiously.

"Planting contracts and contracts for buildings, &c., must be arranged separately, and be protected by fines for unnecessary delay or non-compliance with the agreed terms. On the other hand, it is always good policy to offer a bonus for work well and duly completed inside the period allowed."

"*Hevea brasiliensis* is best cultivated from 'stumps' and planted 220 in the acre; two important factors which must be taken into account in arriving at an estimate of the ultimate cost of bringing an estate into bearing. The following figures are taken from an estate account appertaining to a property in Ceylon situated nearly eighteen miles from a station and four miles from a Government cart road. It may safely be accepted, in all its particulars as to cost, as a fair example of rubber planting, as a whole, not only in that island but in the Mid-East generally:—

	£.
Contract for clearing and burning (say 460 acres) ...	750
,, roading and draining	150
,, supplying and planting 101,000 Pará "Stumps"...	2,100
,, factory, bungalows, coolie lines, machinery, tools, and well-sinking	3,750
,, weeding and maintenance—	
Charges first year	900
,, second year	570
,, third year	510
,, fourth year including coast advances 250 coolies.	915
Making a total of £ ...	9,645

which is not quite £21 per acre.

"As against this outlay, the estimate of rubber returns for the fifth year (1910) was more than realized. It amounted to 5,120 lbs., and sold for

5s. 1d. per lb. net. The estimates for 1911 fix the output at 30,000 lbs., the greater portion of which has actually been sold forward at 5s. per lb."

International Rubber Exhibition.

The Association des Planteurs de Caoutchouc have decided that the 1,000 fr. silver bowl that they are presenting, is to be awarded for the best sample of plantation rubber grown in the Dutch East Indies. The judges will be elected as follows :—Two by the Association des Planteurs de Caoutchouc, two by the Netherland Committee, and two by the Rubber Growers' Association. Particulars may be had at Exhibition Offices, 75, Chancery Lane, W. C., and entries close there on the 1st June.

Some Problems in Tapping.

We are familiar with the development of wound response in tapping trees of *Hevea brasiliensis*. It has been proved by Parkin, Arden, Haas, and others, that the yield obtained in successive tappings gradually increases up to a certain limit, and on estates advantage is taken of this development as far as possible. The fact that one gets such a small yield of rubber in the first two or three tappings is a strong argument against any system of tapping in which a particular area is allowed to rest many months. It is obvious that any area so rested, when re-opened, will give very poor yields of rubber for the first few tappings; this is equivalent to a considerable wastage of bark. Every system of tapping should have for its object the systematic paring away of the bark at a definite rate in accordance with the period fixed for renewal of mature bark. On the subject of wound response, we find that Ridley (*Straits Bulletin*, July 1910) states that the increase in latex begins between the fifth and tenth tappings; and is accompanied by a fall in the percentage of rubber in the latex, though this is more than made up by the increase in quantity of the latex. He notes that in the case of some trees tapped daily and on alternate days at different periods, the increase in the latex began in both series of tappings after the sixth tapping, and yet this was after six days in one and twelve in the other. The increase in latex is usually exhibited in the second and subsequent periods of tappings after fewer tappings than in the first period. A change that Ridley has noted in the colour of the latex from yellow to white, this happening at the same time as the above changed, is according to him comparable with the alteration in colour at seasons of heavy rainfall, one due to excessive water in the latex.

YIELD AND SUPERPOSITION OF INCISIONS.

Vernet (*Journ. d'Agric. Tropicale*, April, 1910) experimented to find out what was the effect of superposition of incisions upon the yield. It is to be expected that an upper incision will to some extent prevent the downwardly-flowing sap from reaching and providing with nutriment the area around a lower incision. And if the two incisions are near enough, though at what distance we cannot yet say, they must drain not only the same systems of laticiferous vessels, but also the same reserves of nutriment. Vernet made a single V incision upon one side of ten seven-year-old trees. Upon the other side he made two V incisions, so that one was as much higher than the V on the other side as the other was lower. The incisions were renewed six times :—

70 double incisions gave 620 c. cm. of latex.
70 single incisions gave 909 c. cm. of latex.

Had each of the double incisions yielded at the same rate as the single incisions there would have been 1,240 c. cm. of latex. These results, of course, do not throw any light upon the second of the above questions, seeing that Vernet does not tell us the distance between the double incisions. Indeed, he does not mention the question, and it is not improbable that he

made the cuts far enough apart to prevent one influencing the other as far as proximity was concerned.—*India-Rubber Journal.*

Periodicity in Plantation Crops.

One is accustomed to the seasonal crops from the Amazon and is apt to imagine that the plantation industry will show a very constant increase in output month by month and year by year. This, however, is not really the case, as there are certain factors operating in most of the rubber-growing areas in the Middle East which prevent tapping operations from being carried out with that regularity characteristic of the rest of the year. While it is true that the majority of mature Hevea trees yield latex on tapping during every week of the year, in some districts there are periods when, on account of the small yield obtainable, tapping is partially if not entirely suspended. In most parts of Malaya, where climatic conditions are comparatively equable, each month shows an almost steady return from the same trees; whereas in many parts of Ceylon this is far from being the case. It has been previously pointed out that in many of the Hevea districts of Ceylon there is a marked dry period extending in each year from January to April. Furthermore, during this season the trees drop their old leaves and produce new leaves, and subsequently flowers, this foliar change being particularly noticeable during February and March. During this period the yield of latex, and generally also of dry rubber, per tapping is small; and it has become a custom on many estates to allow the trees to rest. Yet the second and lesser dry season, so far as the statistics show, does not depress the yield, and the gradual increase in age and number of trees tapped will certainly neutralise its depressing effects upon the crop returns, though these effects cannot be very great. On the other hand, the interference with tapping operations by rains is indicated at two periods of the year, the first about June, the second in November. Of course, there is some degree of variation from year to year in the incidence of the seasons, and between different districts. The periodical decreases in yield are demonstrated by the following returns from (1) an estate in the Kelani Valley and (2) an estate in the Matale district:—

MONTHLY YIELDS OF RUBBER.

1909	Kelani Estate. lbs.	Matale Estate. lbs.	1910	Kelani Estate. lbs.	Matale Estate. lbs.
January ...	—	2,744	January	500	3,055
February ...	—	2,375	February	—	2,232
March ...	174	2,343	March	70	1,911
April ...	351	1,309	April	910	2,277
May ...	180	1,096	May	1,322	567
June ...	44	752	June	1,085	5,566
July ...	70	1,269	July	1,664	3,517
August ...	412	2,166	August	1,783	3,965
September ...	1,274	2,019	September	2,210	4,106
October ...	1,280	2,342	October	2,598	4,702
November ...	1,001	1,610	November	3,070	4,174
December ...	1,230	2,897	December	4,146	4,728

1911.	Kelani Estate lbs.	Matale Estate lbs.
January ...	3,372	3,321
February ...	500	2,972

The crops from the Kelani Valley estate decreased greatly from the first three months of 1910. A recovery followed in April and May; this was

in turn followed by a set-back in June, one of the rainy months. During the rest of the year there was a steady increase, with the increase in age and number of tapped trees. Note the fall in the beginning of 1911. If one goes back to the yields for the year 1909, one can see how marked has been the effect of the first rainy season about the months of June and July, and how the second rainy season has interfered with tapping in November. The returns from the Matale estate are less instructive, owing to some irregularity in tapping arising partly from the irregular resting of trees. The typical dry-season decrease is shown at the beginning of each year, but in 1909 there was no recovery shown in the April returns, and the decrease was continued to the rainy month of June, after which was a recovery. In the year 1910, tapping in the month of April showed an improvement after the dry season, and from the rains the crops during the month of May suffered the most; but there is an inexplicable return for June, after which there is a gradual rise in the crop. In both years the November crop has been affected by the rains.

These points are also brought out, though less accurately, by the study of the monthly shipments from Ceylon. Here it should be remembered that the crop is usually shipped about one month after being harvested. The following table shows the approximate monthly exports of rubber from Ceylon during 1909, 1910, and part of 1911, as computed from the reports of Ceylon Chamber of Commerce. In these reports, the returns are not entered according to the calendar months, and it has been necessary to make an approximation, the exactness of which has been slightly interfered with by the absence of returns due to holidays. The dates given in the second column show the actual periods for the year 1910, the periods of the year 1909 corresponding in length with these. These tables show much inequality in the periods but nevertheless they demonstrate the seasonable changes in amount of crops. If we take into our reckoning the fact that the exports in any month represent roughly the estate output of the previous month, it is very instructive:—

	Actual length of monthly period (1910.)		Exports. 1909.	1910.
January ...	January 4—31	(4 weeks)	65,381	195,268
February ...	February 1—28	(4 „)	98,622	206,940
March ...	March 1—April 4	(5 „)	88,036	211,471
April ...	April 5—May 2	(4 „)	74,175	145,620
May ...	May 3—30	(4 „)	54,964	119,194
June ...	May 31—June 27	(4 „)	116,499	209,127
July ...	June 28—Aug. 1	(5 „)	125,837	352,258
August ...	August 2—29	(4 „)	104,476	135,495
September ...	Aug. 30—Oct. 3	(5 „)	154,923	468,494
October ...	October 4—31	(4 „)	162,030	439,553
November ...	November 1—28	(4 „)	136,960	371,636
December ...	Nov. 29—Dec. 31	(4 „)	190,513	443,526

Note must be taken of the greater length of the March, July, September, and December periods. In both years the exports in February and March were higher than in January, which may be ascribed in part to a gradual increase in the number of tappable trees, and in part to a hurrying forward of prepared rubber in view of the end of the financial year. There is a decided fall in April, and another in May. Here is markedly shown the effect of the previous dry season in reducing the output, the exports in May being not a great deal more than half of those in February. The increase in number of tappable trees has so far been insufficient to

neutralise the more powerful effects of the dry season; but this increase, along with the better conditions as regards moisture, leads to a rapid advance of the exports in June and July. Yet now comes another opposing factor, the rains in June and July have interfered with tapping operations, and we find a drop in the exports during August. The more propitious weather following, and the increase in tappable trees, explains the resumption of a larger export in September and October, which does not seem to be influenced by the second dry season. A decrease in November accompanies the second season of heavy rains, but the upward movement is resumed in December.

While it is impossible to predict the actual percentage of the year's crop that may be expected during any specified part of the year until the whole island is in full production, it seems fairly safe to estimate that the produce from the same trees will probably be approximately 34 to 40 per cent. for the months from January to June inclusive, and 60 to 65 per cent. from July to December.

On many estates, even in Malay, with its less marked climatic variations, tapping is not so vigorously carried on during February and March as at the end of the year on account of the prevalent belief that the trees while passing through their change of leaf yield less and require a comparative rest. As a matter of fact, the food reserves drawn upon during active leaf production are more likely to be those in the twigs and branches than in the trunk of the tree. The turgidity of the cells upon which a copious flow of latex largely depends, is probably most irregular during this period on account, firstly, of the check to transpiration due to the death and fall of old leaves, and, secondly, to the rapid increase in transpiration from the young leaves which usually appear within a few days of the fall of the old ones.

There can be no room for doubt that in future years, when the Hevea trees now planted in the East are in full bearing, there will be a distinct decline in estate crops of rubber during February and March, even though it is the custom to tap more or less regularly on the majority of estates. If the rambong (Ficus elastica) trees in the Dutch East Indies are taken into consideration, seasonal crops show a wide variation on account of the trees being tapped only during certain seasons. What effect the decline in February-March plantation outputs will have remains to be seen; should the periods of shortage in spot rubber for plantation and wild rubber coincide, the position will be accorded much interest.—*India-Rubber Journal.*

Diseases Imported with Plants.

At a meeting of the Board of Agriculture of British Guiana, held on December 21, 1910, it was stated by Professor J. B. Harrison, C. M. G., that Pará rubber plants which had been received recently from Ceylon had been found by the Government Botanist to be infected with a fungus *(Botryodiplodia elasticae)*, common in Ceylon which destroys *Hevea brasiliensis*. Professor Harrison stated, further, that he had submitted a report on the matter to the Rubber Committee, and it had been recommended unanimously that the importation of cuttings and stems of rubber should be subjected to the same inspection as that of sugar-cane. This was necessary, more particularly as, when a new industry like the rubber industry is being started, it is of the utmost importance that every care should be taken to prevent the introduction of disease from other countries.

The consideration of the proposals in connection with the matter was postponed until advice could be received on several legal points.

SELECTED CUTTINGS.

The Practice of Economy on Estates.

In the present days of serious competition and low prices, a full recognition is being given to the importance of effecting the major economies on estates. The nature of these is well recognised, and they have become part of the natural routine in the work of the estate. There are others, however, whose existence is not obvious, which are the outcome of careful thought and consideration, in the light of what may be termed more purely formal knowledge. The purpose of this article is to indicate briefly the nature of some of these economies.

A larger proportion of the expenditure of an estate than is commonly recognised consists of the continual replacement of small articles. Where no inventory is made of such articles, and where the lists, even if they exist, are not checked every few months, losses are occasioned through careless use, and through the misplacing of the articles, because as these are not regularly entered as estate property, the cost of buying them from time to time is considered to be a smaller matter. The keeping of accurate records of the purchase of such articles, and the consequent knowledge of the economy effected by the careful storing of them, will not fail to give the practical agriculturist an idea of the expense that carelessness in this respect has caused him in the past.

In the matter of the larger articles, such as the implements employed in cultivation, although these cannot be lost outright, neglect of care for them shortens seriously their period of usefulness, and lessens their efficiency. When these are put aside for a season, the parts which have to bear the greatest wear and tear, more especially, should be dried, cleaned, and covered with an application of heavy lubricating grease. Attention may also well be given to those portions of them that do not receive direct wear, and here the care will consist in keeping such parts properly painted.

Some of the largest, but less obvious economies can be effected in regard to the animals employed by the agriculturist. Animals are required by him for the provision of energy, or for giving food products. In either case, the policy should be followed of treating the animals in such a way that the food absorbed by them is used as little as possible in doing useless work. Chief among the precautions to be observed in this way will be to see that the animals are stalled as near as possible to the places where they are wanted, and that they are properly pretected against inclement weather. In regard to the former consideration, energy and therefore food, are wasted where it is necessary to take the animals on the estates long distances to be worked, or in the case of cows, to be milked. In the latter connection, animals subjected to untoward conditions of weather must use energy in order to overcome the possible evil effects of those conditions. An interesting illustration of the extent to which the food and energy of an animal may be wasted in this way is supplied by the fact that, with cows, for every pound of rain evaporated from the body, there is consumed more than three-quarters of a pound of solid substance, reckoned as fat which might have gone to form milk.

In continuation, as regards animals, a large amount of the food is often wasted in providing energy for doing useless work, in connexion with ploughing and hauling. In both of these, care should be taken that the animal is attached to the implement or vehicle in such a way that as large a proportion as possible of the power given by it shall be used directly in

the work that is required of it. Generally speaking, as regards ploughing, the line ot the traces should be one and the same with a line passing through their place of attachment and the centre of greatest pressure on the mould board. With reference to haulage, in the case of a very smooth road such as that formed by a line of rails, the plane of the traces should be parallel to the surface of this ; where the road is not smooth, however, the effect of the friction and the fact that wheels are continually endeavouring to mount up out of the surface into which they have sunk, will make it necessary for the traces to slope downwards and backwards. Another matter of importance that is not usually recognised, as regards vehicles travelling over ordinary roads, is the distribution of the load on the carriage. It is most usually, but not always, the case that the heaviest part of the load should be placed over the hind wheels, because firstly, the front wheels make a firm track for the hind wheels carrying the heavier weight ; secondly, the hind wheels are generally the larger so that they sink a smaller distance into the road, and use less of the energy of traction than would be consumed by the front wheels, with the greater part of the load on them ; and thirdly, such distribution of the load enables the vehicle to be turned with greater ease and less damage to the road.

So far, attention has been given to the animal, its mode of attachment, and the load on the vehicle which it draws. It is plain, however, that much more might be done toward the improvement of the roads themselves on which the animals have to work. Bad roads mean constant expenditure in providing extra food for a continual waste of energy, and they also bring about unnecessary injury to animals, vehicles and implements. In the amelioration of such conditions, attention should be given to the provision of smooth and rigid roads and easy inclines, and where it is not possible to provide anything but a rough road the conditions should be bettered as much as may be by the use of vehicles having large wheels and wide tyres. It may be useful to mention here that a cheap and effective implement known as the road drag is much employed in the United States for the economical improvement of roads in agricultural districts. In any case, to whatever extent the improvement of a road may have been effected, attention to its proper drainage is a matter of the first importance, if its best condition is to be maintained.

While mention is being made of roads in connection with agricultural economies, it may be opportune to attend to the fact that much more use may well be made of means for overhead transport and portable railways. The latter are of particular application on estates already possessing permanent tracks for purposes like that of cane haulage, and where wide cultivation is practised. They can be made to connect with the permanent lines, and form a means of effecting the carriage of estate products from the fields, and of manures to the cultivated areas, with no necessity for transfer, and with the greatest economy in the provision of energy for traction. . . . .

The subject may be extended almost indefinitely, among other matters that have a more obvious connection with it being economical methods of keeping manures ; the constant provision of good drainage, especially for increasing the available moisture in the soil ; the provision of wind-breaks for making plants grow better, preventing the falling of fruit, and conserving the soil moisture ; and the utilisation of waste products from the estate. Though these and others equally important cannot be dealt with here, it is hoped that what has been said may suggest useful lines of thought in connexion with the practice of economy on estates.—*Agricultural News.*

The Planters' Chronicle.

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(INCORPORATED.)

The Scientific Officer.

Mr. R. D. Anstead, B.A., is now in Travancore. In all probability he will be back in headquarters about May 10th and will leave about the middle of that month for North Mysore, for a tour of perhaps three weeks' duration.

The Scientific Department Scheme.

In the course of a hasty visit to the office on Monday last the Chairman discussed the proposed scheme for the employment of one or more Assistant Scientific officers and handed to the Secretary the draft of a circular on the subject, to be printed. This circular will probably be sent out next week, its object being to explain the scheme to every member of every District Planters' Association affiliated to the U.P.A.S.I. In this way planters will be placed in a position to discuss the subject in their own districts, so that when the next Annual Meeting of U. P. A. S. I. is held delegates ought to be fully prepared to go closely into the matter.

Scovell's Estate, Ltd.

An advertisement of (for this paper) record length appears in the current number. It speaks for itself, and shows exactly what intending investors are offered for their money. Fruit-farming has been carried on in and around Bangalore with considerable success. Australian grapes have acclimatised themselves there in a remarkable way, and the Navel Orange has flourished, and is flourishing, in Bangalore's salubrious climate. Now that fruit cultivation has been taken up seriously, and on what may fairly be called scientific lines, there ought to be some big developments.

A Quick-Growing Fuel Tree.

With reference to Sc. O. Note 106 (*P.C.*, Vol. VI, No. 15, p. 206):

Seed of *Calophyllum Inophyllum* can, it has been ascertained, be procured at the rate of Rs.2 per pound (packing and postage extra). The plants are in flower now, and if seed is wanted orders should be registered at a very early date. Delivery could, in all probability, be made in June and July next.

The International Rubber Exhibition.

Messrs. Rowe, White & Co., Ltd., appear to have done all they could in respect to preliminary arrangements in London, and now that Mr. J. A. Richardson is at Home all preparations will no doubt be pushed on with.

Planters who have sent exhibits forward—or the Honorary Secretaries of District Planters' Associations concerned—are requested to kindly furnish the Secretary, U. P. A. S. I., with particulars. He has received only very meagre information hitherto.

Insurance of Rubber Trees.

A short time ago a brief series of articles on "Rubber Tree Insurance" appeared in the *Financial News* and led to a great deal of discussion. The articles have now been republished in booklet form. The writer, Mr. Fred. W. Knocker, F.Z.S., F.R.A.I., asked himself at the outset two questions; and he states that after investigation and mature reflection he supplied the answers :—

"Do underwriters at Lloyd's, taking risks on plantation rubber trees, know fully the extent of those risks ?—No ; they do not.

"Do planters, by refraining from insuring the lives of their trees, realise the benefits they undoubtedly risk losing under certain unforeseen circumstances ?—I think not."

He remarks :—"To many the insurance of rubber trees may come as an entirely new and novel form of business. To others it may, incidentally, be known to have been initiated and carried on to a limited extent ; but, as a matter of fact, it is much more prevalent than may generally be imagined. As far as Malaya is concerned, it is more popular in the Dutch colonies of Java and Sumatra than on the Peninsula in British territory. That may be attributed to the fact, not of a national prejudice in any way, but of the island colonies being subjected to tempests of a greater violence than are usual on the Peninsula. So far, insurance seems to have been effected only in connection with fire and tempest (wind), though there are many other risks which underwriters might with advantage bestow their attention upon. In fact, I see no reason why a policy covering 'all risks' might not be seriously contemplated, barring, unquestionably, those arising from pest and disease. Damage, or total loss, from this cause is, as I have pointed out on a former occasion, due more often to the planters' carelessness and want of experience, and on that account scarcely demands the consideration of Lloyd's. As far as that goes, a clause might be introduced in an 'all risks' policy, excluding all causes traceable to the carelessness or inexperience of the estate manager ; though, on second thoughts, even that might be worked down to a very fine line of contention."

Mr. Knocker's conclusion is that "it would appear there is the prospect of much business to be transacted outside the City's magic circle for those of Lloyd's underwriters interested in rubber-tree risks, and who are sufficiently enterprising to turn their attention down the bypaths pointed out."

It is unnecessary to comment on this or to express any opinion as to the virtues of "Life Assurance for Rubber Trees"—a point which planters should consider for themselves.

It may be said, however, that the Secretary to the U. P. A. S. I. has received from Home an intimation to the effect that it is possible that Insurance of the kind referred to might be arranged in London ; but that the whole question would turn on the *bona fides* of planters who might wish to take out politics.

Any planter who may wish for more detailed information is requested to communicate with the Secretary, U.P.A.S.I.

The subject is also referred to in an extract from the *Economist* printed on p. 241 of the present issue.

Indian Tea in the United States.

Mr. R. Blechynden's report upon the work done in connection with the India Tea American Advertising Fund during the months of October, November and December 1910, has been published by the Indian Tea Cess Committee ; but space cannot be found for it in this number of *The Planters' Chronicle.*

Scientific Officer's Papers.

LXII.—Eucalyptus Trees Suitable for India.

Many tea estates are seriously considering the matter of fuel supply, and it is very desirable that some quick growing tree, suitable to the climate, should be planted up to take the place of the fuel reserves which are being depleted. In connection with this a note was published recently describing two local trees which are considered suitable.

In the Nilgiris, and other districts, Eucalypti of various kinds have been grown with success, but more might probably be done with these valuable trees.

The Agricultural Research Institute, Pusa, have recently published a Bulletin (No. 21 dated September 1910) entitled a 'Memorandum regarding leading Eucalypts suitable for India.' This contains much interesting descriptive matter about a number of species considered suitable for the country. In the Introduction, Mr. F. Booth-Tucker puts forward a plea for the systematic trial of Eucalypts.

"The fact that so much success has attended the tentative efforts put forth in various parts of India would seem to show that the time has come to take up the question of Eucalyptus cultivation on a much larger scale than has hitherto been attempted, and with perhaps a more careful and systematic consideration of the climatic conditions to which the different varieties are so particularly sensitive.

"Large sums are now being expended by Government in fighting malaria by means of quinine and mosquito extermination, which, however necessary, offer, so to say, *no collateral benefits*, such as are undoubtedly to be looked for from the family of trees to which Australia is supposed to owe its immunity from malaria and its singular healthiness.

"But apart from this are the valuable products in the shape of a hard and quick growing timber, often attaining gigantic proportions in less than one-tenth of the time taken by most trees, besides its oil, kino, tannin, bark used for roofing and paper, and other products. One variety, the giant Amygdalina, is said to yield as much as 3 lbs. of oil per 100 lbs. of leaves, and also to be frost and snow resisting, and is thus especially suited for hill districts.

"The blue gum (*E. globulus*) which has been mostly tried in India is not suited to extremes of either heat or cold, but prefers a temperate climate. Hence its success in the Nilgiris. But because it has failed under unsuitable climatic conditions, and because for similar reasons the few other varieties so far tried, such as *Robusta*, *Tereticornis* and *Meliodora* have also sometimes failed, the conclusion has often been formed that Eucalypts are not suited to India.

"As a matter of fact, among the 140 known varieties, there are Eucalypts which are suited to every kind of climate from the ocean to the snow lines of the Himalayas.

"Some will stand any amount of moisture and will drain pestilential swamps, and would probably revolutionize the climate of the Terais, . . . Others can endure the most arid seasons. Others again are seldom met with more than fifty miles from the sea.

"I believe that it will be found almost invariably that, where there has been failure, it has been due to putting "Ahmad's turban on Mahmud's head."

"The accompanying list does not pretend to be exhaustive, as many promising varieties were reluctantly omitted in order to concentrate attention for the present on those which seemed likely to give the most immediate and rapid results.

"With a view to encouraging and popularizing the cultivation of the Eucalyptus, it is suggested :—

1. That nurseries should be established in as many places as possible for the cultivation and distribution of young plants of suitable varieties.

2. That the Forest, Canal and Railway Departments be encouraged to establish plantations.

3. That Agricultural Farms and Colleges, and District and Municipal Boards should have their special attention called to the matter.

4. That an Annual Arbour Day Celebration shall be fixed on a date suitable for each Province or locality, when this and other valuable varieties of trees may be planted by school children.

5. That the co-operation and assistance of the Press be invited.

6. That a Eucalyptus Association be formed for the purpose of pushing the cultivation of the Eucalyptus.

7. That special concessions and grants of land be made to persons, companies, societies, villages, or associations willing to establish at their own expense nurseries, groves, avenues, or plantations of Eucalyptus."

Among the records at this office is a Bulletin of the Agricultural Experiment Station, Berkeley, California, describing a large number of Eucalypti cultivated in that country and containing instructions for raising and growing these trees.

Any planters who are interested in the matter should communicate with me, and it is possible that something could be arranged whereby experiments might be conducted on a fairly extensive scale with some new varieties.

RUDOLPH D. ANSTEAD, *Planting Expert.*

General Notes on Eucalypts.

(From "Memorandum Regarding Leading Eucalypts Suitable for India," by J. Booth-Tucker, Commissioner, Salvation Army, Simla).

Cold Climates.—Alpina, Coccifera, Amygdalina, Gunnii and Pauciflora, Globulus (fair).

Temperate Climates.—Globulus, Calophylla.

Dry. Tropical Arid Climates.—Corynocalyx (Sugar Gum), Planchoniana, Globulus, Tessellaris, Eugenioides, Salubris, Macrorrhyncha, Corymbosa.

Wet Humid Tropics, near Coast.—Marginata (Jarrah), Tereticornis, Diversicolor (Karri), Pilularis, Botryoides.

Humid Tropics, Alluvial Mountains and Rivers.—Goniocalyx, Leucoxylon, Raveretiana, Resinifera, Rostrata, Amygdalina, Globulus, Cornuta.

Swamps.—Gunnii Robusta (near sea).

Ornamental.—Phoenicea, Miniata, Ficifolia.

Railway Sleepers.—*(Hard).*—Marginata, Rostrata, Globulus, Corymbosa, Goniocalyx, Gomphocephala, Robusta and Viminalis.

Fissile (Shingles, Palings, etc.)—Aymgdalina, Obliqua, Macrorrhyncha, Eugenioides.

Fuel.—Obliqua, Eugenioides, Globulus.

Oil (leaves).—Amygdalina, Oleosa, Leucoxylon, Goniocalyx, Globulus, Salubris and Obliqua.

Bark for Roofing etc.—Obliqua, Eugenioides, Macrorrhyncha.

INDIAN TEA ASSOCIATION.

Extracts from Abstract of the Proceedings of a Meeting of the General Committe, held at Calcutta on the 11th April, 1911.

Correspondence with the Indian Tea Association, (*London*).—The Committee considered letters dated 3rd, 10th, 17th and 24th March, from Sir Jas. Buckingham, C. I. E., Secretary, Indian Tea Association, (London.) The principal matters dealt with in these letters were the following:—

(*a.*) *Scientific Department.*—The question of the extension and reorganisation of the Scientific Department was discussed in the letters. Under the scheme which has been submitted by Dr. G. D. Hope, the Chief Scientific Officer, an experimental station is to be established at a central point in Assam. Mr. P. H. Carpenter, the Assistant Scientific Officer, will be located there, as will also an entomologist and a mycologist. The question of the site to be selected for the station is under consideration, and when it is settled, the necessary buildings will be erected. These will consit of a well-equipped laboratory, and two bungalows. As Mr. C. B. Antram, who is at present the entomologist to the Association, is leaving the service, his successor has to be appointed. A mycologist has likewise to be selected. These two appointments will be made in London by the Indian Tea Association. The progress of the negotiations with respect to them was recorded in the letters from Sir Jas. Buckingham, which are quoted above.

(*b*). *Sale of Tea Waste.*—The question of the sale in India of low quality tea and of tea waste was referred to in the letter of 17th March 1911. The London Committee drew attention to the remarks made concerning it, in the proceedings of the Calcutta General Committee, dated 14th February. They suggested that the Chairman of the Corporation of Calcutta should be asked to take action under section 502 of the Calcutta Municipal Act (B. A. III of 1899). By this section the Chairman is authorised to seize any impure tea which may be brought to his notice, and to place it before the Municipal Magistrate for an order as to its disposal.

In replying to this letter on the 6th April, the General Committee (Calcutta) said that the question was engaging the attention of the Calcutta Tea Traders' Association. They also forwarded a copy of a circular which that Association had issued on the 1st April, and of which they approved. Statements were made in the circular to the effect that tea waste, damaged tea and tea sweepings are being bought from factories, under a guarantee that they are to be used for chemical purposes only. It is, however, believed that, notwithstanding the guarantee, a considerable portion of this tea finds its way into the bazaars. The Tea Traders' Association warned tea garden agents against this practice, and recommended that tea waste should not be sold on the garden, unless there is satisfactory evidence to show that it is to be exported for the manufacture of caffeine. The Association also proposed to communicate to the Health Officer of Calcutta any cases where it could be proved that the waste is being distributed for human consumption.

(*c.*) *Weighment of Tea in London.*—In the letter dated 24th March, reference was made to a resolution recently passed by the Tea Buyers' Association in this connection. It was to the effect that, in future, hundredweights and quarters should not be used in recording the weights of tea on commercial documents, but that the gross tare and net should be expressed in pounds only. After considering this proposal, and consulting the wharfingers with respect to it, the London Committee had accepted it. They thought that the change would be advantageous to sellers on the London market.

RUBBER.

In Defence of the Rubber Boom.

A correspondent who signed himself "Equator" wrote recently to the *Economist* (London) as follows:—

Although the papers are full of the marvels of this modern enterprise, it is not the "Rubber Boom" which I am going to write about, but the true cause of it. It is not a "Market Rig," as most booms are, but the genuine result of one of the most profitable forms of legitimate cultivation that could be found in the world to-day. When one reads of companies with reasonable capitals, administered by honest men, who calmly sit down at board meetings and declare and distribute to their shareholders, as dividends for the year, sums such as 105 per cent., 150 per cent., 100 per cent., 135 per cent., 102 per cent., 140 per cent., 75 per cent., 150 per cent., 165 per cent., 100 per cent., 125 per cent., 225 per cent., and 287 per cent. for each and every £100 invested, surely then one cannot be surprised at the public waking up and rushing to secure shares in any enterprise started with equally legitimate prospects. Such profits have never before been heard of in an agricultural industry, and yet in the rubber world there are dozens and dozens of such enterprises open to the investor. That is the boom! And why is this? It is because one acre of land, planted with rubber in the right district, under the right conditions, with right distances between the trees, with the right rainfall, and other contributing influences, will, after the lapse of a few years, produce from £50 to £150 per annum net profit per acre; hence it is perfectly legitimate to estimate that an estate of 3,000 acres, planted with 300,000 trees, will, in due course, produce a revenue of £150,000 per annum. Such an estate with a capital of, say, £120,000, will pay dividends in a few years' time of at least £100 per cent. per annum, and set £30,000 per annum to reserve fund.

As a rubber investor myself, and one who has travelled in the tropics, I must at once be careful not to mislead the untutored investor. I have just pointed out that the land must be in the right district, and I will, therefore, call your readers' attention to any map of the globe showing the Eastern and Western hemispheres; and from my own point of view I would recommend every investor to keep within a limit of a few hundred miles north and south of the Equator, for of all the plants or shrubs that produce profit by cultivation, there is none equal to the *Hevea Brasiliensis* for requiring an entirely tropical heat. By this I do not mean the scorching rays of the sun, or an incessant tropical downpour, or, again, a fluctuating rainfall spread over certain periods of the year, but what is essentially required for the favourable growth of this delicate rubber tree is a truly tropical heat. The atmosphere, in effect, should always be charged with a certain amount of moisture, and a rainfall of half an inch a day would be practically ideal. This is only to be found with reliability for the purpose of this plant within the sphere that I have just mentioned.

I should not, for one moment, wish it to be attributed to me that I had said that the *Hevea Brasiliensis*—or the much-abused but very valuable Rambong—wili not grow to advantage outside this latitude, but the further it is removed from the Equator and the conditions I have mentioned, the longer the tree will take to come to maturity, the less latex it will produce, and the less number of years will it last.

Nor must it be attributed to me to suggest that all the lands within this latitude are suitable, for, as I have already said, a delicate tree requires for its vigorous growth many contributing influences, not the least ot which is the physical condition of the ground. In fact, the ideal is an undulating and

largely self-drained alluvial deposit, with an elevation of from 100 feet to 300 feet above sea level. Below this level the spike-like roots, which burrow down into the earth to a depth of from 8 feet to 12 feet, may come into contact with water, and then the tree, when tapped, will turn yellow and die. Above this level we get out of the permanent humidity of the atmosphere which I have referred to, and the higher the elevation of the land the longer will your tree take to mature, and where you have not an alluvial soil, and come upon stony or rocky ground, your tree will again be stunted and take longer to grow, and hence the limits that I have given with regard to the Equator can in no way apply but to a small portion of that area, and to illustrate my case, let me take Sumatra. Here, upon the east coast, is perhaps the most ideal spot in the world for Hevea rubber plantations. In the first place, you have from the Simpang Kiri River in the north-east to Rokan Kiri River on the same coast about 300 miles south, a splendid undulating territory, marvellously drained, and at the same time irrigated by dozens of small rivers. The surface of the alluvial part of this land for an average of about 75 to 100 miles inland hardly in any case rises to an elevation of more than 500 feet. This alluvial plain is continually being fed by the detritus from the volcanic hills at the back, and which supplies the richest soil for the luxuriant growth of Hevea. You have an almost continual rainfall spread over the year; you are sheltered from all the great winds on the western side by the spine of mountains, which run the whole way from north to south of the island—and from the west you are protected by the Malay Peninsula—and then you have a large and industrious local population, and, close handy, a further population of over 30 million people in Java, under the same Government, which is always prone to assist a company—whether English or Dutch—in the development of its estates.

Following on my geographical line, it will be observed that one just misses Java, and although there may be estates in that island that are favourable to Hevea, on the average it is not in the least suited. It is hilly, and most of the plantations are far above the requisite elevation—it is more exposed to winds and storms than the particular district of Sumatra that I have mentioned, and the rainfall is less regular.

Then we come to Borneo, and although the possibilities of this island (which is the next largest to Australia) are great, there is at present only a sparse population, in parts it is mountainous, and, without wishing to discredit it, we have all heard of the "Wild Man of Borneo," and it is very unsafe to venture far inland; moreover, it is difficult of access.

Tracing our way backwards, we come to the equatorial line through Africa, and here you have the French Congo, the Congo Free State, and British East Africa; but the possibilities are not comparable to Sumatra. The climate is not so healthy, and once a little way inland, there would be many disadvantages in relation to transport, and I have yet to hear that the physical conditions are such as to assure that essential feature, natural drainage.

Last, but not least, I cross to that wonderful country, Brazil, with its marvellous and magnificent meandering Amazon, passing through the vastest alluvial plain in the world, teeming with every phase of tropical growth, the birth place of the *Hevea Brasiliensis*, with virgin forests of countless millions of gigantic trees. There may be spots in these vast tracts where doubtless many and many a thousand acres of land could be found, with undulating ground and natural drainage. but—yes, that tantalising little "but" has to come in—judging, as we must, by comparison, we find no equivalent to the "Oost Kust," as we planters call it. (*a*) Transport facilities do not

compare; (*b*) the labour problem does not compare; (*c*) the general character of the land does not compare; (*d*) the Government does not compare, for there is an export tax in Brazil, which may at any time be increased, whereas there is no tax on the East Coast of Sumatra; (*e*) the cost of labour does not compare; (*f*) the equability of the rainfall and climate does not compare, and, in fine, no man who understands the costs surrounding the production of plantation rubber from a well-ordered and regularly planted Hevea garden, can venture to compare it with the costs that must be entailed by a nomadic tribe, who have to penetrate far into these wonderful natural forests to find the gigantic trees from which they have to gather and prepare their Pará rubber.

Plantation rubber is destined to control the world's markets.

In corroboration of my statement of the great richness of the soil of the East Coast of Sumatra, it is here that the Dutch are making such colossal profits from the growing of tobacco, and they are now waking up to the programme of interplanting their estates with Hevea while putting in their tobacco. But this can only be done once, for tobacco, in any event, although only in the ground a few months, can only be grown on the same land every seven years, and hence by the time the land is again ready for tobacco, the rubber trees would be too large, and make far too much shade to attempt another crop of tobacco; and, moreover, the rubber trees would be producing a large permanent profit, whereas tobacco, although so very profitable on the average, is nevertheless quite a speculative crop.

There is one feature which seems strangely lacking in the minds of those having control of many valuable rubber estates, and that is, that I have not seen hitherto any statement of the estates being adequately protected by insurance from the many risks that must perforce exist—videlicet, destruction by wild animals, fire, storms, pests, &c. Surely, with a commodity that is realising to-day at a rate of over £40,000,000 per annum, the possibilities of loss ought not to be left to chance! And now, Sir, with apologies for my very dry musing, may I yet say another word about the vast sum of £40,000,000 which represents this world-wide commodity? How can it, with reason, be suggested that any "corner" or "rig" can be made in it? The production and consumption are both spread over too wide an area, and are in too many hands. It is only recounting history and recent happenings to say that large fluctuations may occur, and they may be assisted by speculation, but the true cause of any such rise or fall will be traced to fluctuations of trade and supply and demand, but I am one who sees a great and permanent future for plantation rubber, and the prices for the next twenty or thirty years to come will be always such as to pay gigantic dividends on well-managed and cultivated and well-chosen estates.

Johore.

A gentleman who visited Johore lately, and saw again districts that he had seen only two years ago, was very much struck with the change over the whole country. A year or two ago the district was an interminable wet forest, swarming with wild beasts. It is now a plain of young *Hevea* trees, too wide to see across even from the summit of some of the hills. Any tree other than *Hevea brasiliensis* appears as quite a variety; in fact fruits, palms, and vegetables, and even pigs, have practically disappeared from these areas—an unusual result over such a vast territory in a remarkably short space of time. Sumatra, it is stated, is opening up very fast indeed, and will soon give us some surprises in the way of planted acreages under *Hevea*.

SELECTED CUTTINGS.

Insect and Fungoid Pests.

Probably the most important advances in agricultural and horticultural practice in the present day are in the direction of controlling insect and fungoid pests. Economic considerations generally compel the grower to aim at large crops; in consequence, losses caused by disease may be very heavy. All the conditions of modern cultivation tend to favour the pests; the distribution of seeds and of nursery stock from district to district facilitates the spread of spores and ova, whilst the dense planting and the continuous cropping provide a succession of host plants. Further, the high nitrogenous manuring invariably practised as agriculture and horticulture become more developed seems to increase the susceptibility of the plant to attack. In all countries where agriculture is progressing there is growing up an enormous literature dealing with these pests. A few of the more recent publications only are referred to in this article, but the list does not profess to be complete. Two general methods are in use for combating the pests; natural enemies are encouraged, and, if, necessary, introduced into the country, and poisons are applied sufficiently potent to kill the pest, but not the infected plant.

In output of literature the United States easily heads the list. Under the direction of Dr. Howard, the Bureau of Entomology of the Department of Agriculture has accomplished an enormous amount of work of both scientific and technical value. A recent Bulletin by H. E. Burke deals with the flat-headed borers (Agrilus, causing damage to forest trees to the extent, it is estimated, of 100,000,000 dollars annually in the States alone. Methods of treatment, are now known, and much of the damage can be prevented. The San José scale (*Aspidiotus perniciosus*) is shown by A. L. Quaintance to yield to treatment with petroleum or kerosine washes, or with lime and sulphur washes. "Brown rot" (*Sclerotinia fructigena*) and the plum curculio (*Conotrachelus nenuphar*) are described by W. M. Scott and A. L. Quaintance as causing great injury to peaches and plums respectively, but they çan be kept in check by a lime-sulphur wash containing lead arsenate. V. L. Wildermuth writes on the clover-root curculio (*Sitones hispidulus*), which injures clover, although it is probably not a common pest. It is eaten by a number of birds, and, in the larval stage, is attacked by a fungus. W. M. Russell describes a cigar-case bearer (*Colephora caryaefoliella*) attacking picari trees; it is not yet abundant, and can probably be kept in check by lead arsenate washes. H. O. Marsh deals with the common Colorado ant (*Formica cinereorufibarbis*) which has fallen under the ban because it protects melon aphis. It is said to be a common thing to see the ants busily engaged in killing and carrying off the syrphid larvae which were destroying the aphides. Adults of a ladybird, *Hippodamia convergens*, the nabid bug, *Reduviolud ferus*, and a species of Chrysopa were also carried away by the ants. The simplest method of exterminating seemed to be watering the nests with a weak solution of potassium cyanide.

Not only at the Department of Agriculture, but also at the colleges, are investigations undertaken, and a large number of bulletins are issued. Many of these make no claim to originality, and are mainly of interest to us as showing how the American colleges try to educate the farmers. These bulletins are always well illustrated, pictures being given of typical infested plants and of the pest in its various stages, so that recognition shall be easy. Preventive and curative methods are described where known, and farmers are told where they may apply for further information. Admirable bulletins of this class are sent out by the agricultural experiment stations of the West

Virginia University, the Purdue University, the Colorado Agricultural College, and others.

Turning to the British dominions, good work is being done in India, and is published in the Pusa Memoirs and *The Agricultural Journal of India.* The Transvaal work appears in *The Transvaal Agricultural Journal.* In a recent issue of *The Agricultural Journal of the Cape of Good Hope*, Messrs. Laws and Manning discuss the eradication of ticks on the veld.

The scientific work of the entomological staff of the West Indies appears in the West Indian Bulletin, and the more technical work in *The Agricultural News.* Mr. F. W. South deals in a recent issue of the bulletin with the control of scale insects by means of fungoid parasites. The fungi can be introduced in two ways; material containing fructifications may be hung on the tree near to the scale-infested part, or the fructifications may be stirred up with water, which is then sprayed on to the tree. When the spores germinate, the hyphae grow under the scales and destroy the insects. In every issue of *The Agricultural News* a section is devoted to insect and fungoid pests; the diseases of rubber trees have recently received considerable attention. Some of the islands, as Jamaica and Trinidad, issue their own bulletins, in which the staff publications appear. In the Trinidad bulletin Mr. Rorer deals with pod-rot, canker, chupon-wilt of cacao in a well-illustrated paper; spraying is shown to be effective, but definite instructions cannot yet be given owing to the absence of local experience of the treatment.

The Circulars and Agricultural Journal of the Royal Botanic Gardens, Ceylon, contain accounts, by T. Petch, of root diseases of Hevea and of *Acacia decurrens*, which is extensively planted as a wind-break in tea plantations and also for green manuring. The brown root disease, caused by *Hymenochaete noxia*, is the commonest root disease of Hevea in Ceylon, although this fungus does less damage than *Fomes semitostus. Sphaerostilbe repens* is also recorded, but is as yet not common. Two diseases of Acacia are described, one caused by an agaric, *Armillaria fuscipes*, the other by *Fomes australis.* A remarkable plague of a large snail, *Achatina fulica*, is described by E. E. Green, which swarms in millions in one area of the island. On the whole, it is considered to do more good than harm, as it feeds on animal and human excrement, and does comparatively little damage to vegetation. Besides the circulars and journal, a series of leaflets are sent out from Ceylon.

Much of the Japanese work is published in the Journal of the College of Agriculture, Tokio, a beautifully illustrated periodical brought out in English and German. Vol. ii, No. 4, contains a paper by Ichiro Miyake on the fungi attacking rice. The list is, the author believes, complete, and as full references and descriptions are given, it must prove extremely valuable to other workers. It is in the true scientific spirit that the Japanese have broken down the barrier of language and issued their scientific publications in languages that can be read in the West.

In addition to the work going on at some of the larger agricultural colleges and departments in Great Britain, the smaller colleges are also studying the pests and diseases that occur in their districts. Mr. G. T. Malthouse recent, in a bulletin issued by the Harper-Adams Agricultural College, dealt with the wart disease of potatoes (*Chrysophlyctis endobiotica*), which has been doing much damage in Shropshire and Staffordshire. Accounts of the various diseases are also circulated as leaflets by the Board of Agriculture, as well as in their Journal.—*Nature.*

Fertilisers.

Mr. C. M. Conner, Assistant Director of Agriculture, writes in the *Philippine Agricultural Review* :—

Plants require food in order to grow and develop just the same as animals, except that the food which plants use is in a different form and is derived from the soil and air.

Plants will be small and give little or no fruit, or will be large and give a heavy yield of fruit, according to whether or not they can get plenty of plant food and sunshine. If the soil is rich and the plants are crowded, either by other plants of the same kind or by plants of a different kind, so that they do not get plenty of sunshine and air, they will be small and stunted. An improved variety of plants is the result of furnishing the plant with plenty of food and protecting it from other plants by keeping the ground clean and cultivated, just as an improved breed of animals is the result of good treatment. Improved plants or animals if neglected by man revert to their original type, or if they have been under domestication for a long period of time will probably disappear altogether, if not cared for by man. In order to grow the best plants it is not sufficient to protect them from other plants, but it is necessary to supply plant food of the proper kinds and in the proportions required by the plant. Some soils possess all the elements of plant food in sufficient quantities to develop the plant to its highest limit. Fertilisers will have no effect on such soils. However, there is a limit to the development of any plant; if there were tons of available plant food in the soil, a plant growing upon it can not develop beyond its capacity any more than an animal having an unlimited supply of food would develop very far beyond the normal for that kind of animal. Most plants growing as nature places them do not develop to their limit for the reason that they are retarded by the presence of other plants or by the absence of plant food.

The elements which plants derive from the soil and which concern the farmer most are nitrogen, phosphoric acid, potash, and lime. There are other elements used by the plant, but, as a rule, they are found in most agricultural soils in sufficient quantities to supply the wants of the plants. The phosphoric acid, potash, and lime found in the soil came originally from the rocks. When rocks are exposed to the air they crumble and decay, the rains wash the find particles down to lower levels and form what is known as soil. This decay or rotting of the rocks goes on continuously and the elements of plant food are liberated in this way and become available to plants. As soon as a sufficient quantity of soil is formed for plants to take root, small plants start growing on the soil and acid in the decomposition of the small particles by the secretion of certain acids by their roots. The mature plants fall upon the ground and add to the fertility of the soil already formed, if they are not destroyed by fire.

When the dead leaves and stems become incorporated into the soil they form humus. This term humus applies to any partially decomposed organic matter. The cells of the plant being partially decomposed act as a sponge in holding water, hence a soil rich in humus has a large water-holding capacity. Plants growing upon such soils during a period of drought are able to grow on account of the presence of this water in the humus, whereas they would probably die were there not humus in the soil. When this humus becomes thoroughly decomposed it adds to the fertility of the soil in that the elements stored up in the plants while growing become available for other plants as soon as decomposition takes place.

Soils will be rich in phosphoric acid, potash, or lime according to the composition of the rock from which they were formed. For example, if the

soil is formed from limestone rock there will be an abundance of lime in the soil; if formed from rocks free from lime of course there will be no lime in the soil, and the soil is likely to be sour or acid; a soil formed from a rock rich in potash will naturally be rich in this element. Most clay soils are rich in potash, whereas sandy soils are usually deficient in potash. The nitrogen that is in the soil came originally from the air. Nitrogen gets into the soil in several ways. The principal way is by the agency of leguminous plants, such as beans, peas, clover, etc. These plants have the power of collecting free nitrogen from the air by means of certain bacteria which live in the tubercles or nodules on the roots of the plant. This nitrogen is used by these plants in building up their tissues, but when these plants die the nitrogen that has been collected by the agency of these bacteria and stored in the stems, roots, and leaves of the plants becomes available to other plants growing upon the soil as soon as decomposition sets in. Nitrogen gets into the soil also by being washed down from the air by rains after it has been formed into a nitrate by the electricity in the air, such as lightning. Soils containing large quantities of organic matter are usually rich in nitrogen. However, plants can not make use of this nitrogen locked up in the organic matter until it has decayed. As mentioned above, decay is hastened by exposing the soil to the air, hence frequent plowing will make the elements of plant food available more rapidly than if the soil were allowed to lie undisturbed. The fertility, or the ability, of the soils to produce large crops, can not well be determined by chemical analysis. Chemical analysis, however, will determine whether or not elements such as nitrogen, potash, phosphoric acid, or lime are deficient or totally lacking in the soil. Walker in his "Sugar Industry in the Island of Negros" makes this point very clear and is quoted here: Now, in 1 hectare of land, from the surface to a depth of 20 centimetres, or the average depth to which the cane roots penetrate, there are 2,000 cubic metres of soil of an approximate apparent specific gravity of 1·5 or 3,000,000 kilos. One-hundredth of 1 per cent. of this, the smallest difference which can be detected by an accurate chemical analysis, would amount to 300 kilograms of any one element, so it may be readily seen that at least five, and more probably ten, years would be required before any depletion of the soil from successive crops of sugarcane would be suggested by chemical analyses, even if absolute accuracy in sampling and in analytic methods were assumed, not to mention the greater changes which might be brought about during such a long period of time by mineral matter carried up from greater depths by the soil water, or carried away by rains.

These figures make no pretence at even moderate accuracy, but serve to illustrate the relatively small order of magnitude of changes in the composition of a soil which may brought about by the cultivation of sugarcane. It is likewise apparent that the ordinary commercial fertilisers would need to be used in quantities of many tons to the hectare before any improvement in the soil as regards its actual composition could be detected. This should not be construed as an argument against the use of fertilisers, for they are undoubtedly at times of great benefit, even in very fertile soils, but the way in which they act and indications for their use, although the matter has been carefully studied for many years in all parts of the world, are very little understood.

Cameron states the most modern views on this subject as followes :—

Soil chemistry is a very complex subject, into which we are just beginning to get glimpses, and the supply of mineral nutrients is only one of the important details in a very intricate problem. It is of course patent to

everyone that fertilisers sometimes, in fact frequently, produce larger crop yields. Sometimes the contrary is true, but it is absolutely certain that at the present time no one can, nor are there any methods available by which one can, safely predict what fertilisers and how much should be used.

Plants require their food in certain proportions. A soil may be rich in *one* of the elements and still be called a poor soul. For example, a soil may be deficient in nitrogen and the crops growing upon it would be poor, whereas there might be a sufficient amount of available phosphoric acid and potash to grow a crop twice the normal size, provided that the nitrogen was supplied. This same statement may be applied to the other elements of fertility in the same way. There is no way of determining whether or not a soil is deficient in these various elements without making a field test. In order to do this, select a uniform piece of ground and lay out eight one-tenth hectare plats, preferably twice as long as wide, prepare the ground thoroughly and apply chemical fertilisers as follows :—

Plat.	Kilos.	Fertiliser.
No. 1.	20	Nitrate of soda.
No. 2.	20 12	Nitrate of soda. Sulphate of potash.
No. 3.	12 10	Sulphate of potash. 45 per cent. acid phosphate.
No. 4.	20 10 12	Nitrate of soda. 45 per cent. acid phosphate. Sulphate of potash.
No. 5.	10	45 per cent. acid phosphate.
No. 6.	20 10	Nitrate of soda. 45 per cent. acid phosphate.
No. 7.	—	No fertiliser.
No. 8.	12	Sulphate of potash.

This is on the basis of 600 kilos of a fertiliser containing 5 per cent. nitrogen, 8 per cent. phosphoric acid and 10 per cent. potash.

Plant these plats with the same kind of seed and in the same manner, harvest and weigh the crop. The weight of the crop will show the effect or non-effect of the fertiliser. This same experiment can be tried again by varying the rate of fertiliser used per hectare. Great care should be taken in applying the fertiliser and in weighing the crop, or the result may be misleading. Corn, rice, or sugar may be planted on the plats.

Each element of plant food mentioned above serves a different purpose in the building up of the plant. For example, nitrogen is used in developing the leaf and stem of the plant. It should not be understood, however, that plants producing only leaves and stems need only nitrogen, but that nitrogen is more important to such plants than are the other elements of fertility, hence grass which is not grown for seed requires a larger quantity of nitrogen as compared with the other elements of fertility. Plants producing starch or sugar use large quantities of potash in the forming of this starch or sugar, hence such plants as sugarcane, manihot, potatoes, rice, etc., require liberal quantities of potash for the best development. Plants producing seed, such as wheat, corn, rice, etc., require large quantities of phosphoric acid. Lime is used by all plants more or less in building up the stem and body, or the woody portion of the plant.

OFFICIAL PAPERS.

The Madras Planters' Labour Act.

THE NILGIRIS.

The following are extracts from the report by Mr. S. P. Rice, I. C. S., District Magistrate of the Nilgiris, on the working of the Planters' Labour Act I of 1903 for the year 1910 in the Nilgiri district accompanied by the usual statement in the form prescribed in G. O. No. 1063, Judicial, dated the 14th August, 1909 :—

The number of prosecutions instituted under the Act fell from 967 to 927 cases. The fall is chiefly traceable to the file of the Taluk Magistrate, Gudalur, where the number of cases filed under Sections 24 and 30 of the Act fell by 14 and 88 cases, respectively, accompanied however by a slight rise generally as seen from the statement in the files of the other Courts in the district and by a considerable rise in Gudalur under section 23 of the Act. There were no special causes at work to account for the fall, which may be attributed to the ordinary fluctuation in the working of this special Act

Over 25 prosecutions were laid by each of the undermentioned estates:—

Coonoor Taluk.—	Taimalai Estate	26
	Devarshola	114
	Mayfield group	72
	Glenvans	50
	Wentworth	58
Gudalur ,, —	Guynd	41
	Balmadis	43
	Barham	32
	Helen	32
	Seaforth	26

It is a significant fact that eight of these ten estates appear in the same connection in last year's report, that Barham and Helen filed twenty-four cases each last year and that Kelly and Suffolk filed, respectively, in the year under report twenty-one and twenty-four cases, respectively. It should, however, be remarked that Guynd, Suffolk, Kelly, New Hope, Hope, Lauriston, Barham and Helen are in the O'Valley where admittedly the amount of labour employed is very considerable and where management is said to be good. The theory, therefore, that prosecutions are numerous on estates where the treatment of coolies is indifferent is hardly borne out by these figures. The increase of prosecutions under section 23 of the Act is chiefly due to the Wentworth estate which contributed eleven of the number. The bulk of the prosecutions was, as in the previous year, contributed by the Gudalur Taluk and is almost entirely due to the increased use made of the Act by maistries there. All these estates are of considerable area.

I consider that the Act has worked fairly well both for planters and for coolies.

The heavy pendency in the Gudalur taluk noticed by the District Magistrate in paragraph 5 of his report for 1909, dated the 5th March 1910, R. O. C. No. 47-M., and printed in G. O. No. 833, Judicial, dated 2nd June 1910, continued to increase in a cumulative fashion, notwithstanding the change in the system introduced as an experimental measure with the concurrence of the Nilgiri Planters' Association since the latter part of June 1910 of entrusting warrants direct to the police for service in the ordinary way instead of to maistries themselves as before. A special report was made to

Government in respect of this change and it was recorded by G. O. No. 1083, Judicial, dated 18th July 1910.

From such information as I have at present and judging by complaints I have received from certain planters, there is considerable reason to doubt whether the system introduced by Mr. Francis of issuing warrants to the police rather than to maistries has been successful. The true remedy seems to be less in a change of system than in what I may call an organic change that is needed in the police themselves and this, I fear, is difficult of attainment unless indeed something might be accomplished by the intervention of Government. At present it is very hard to get any district and still less Mysore to take much interest in the execution of labour warrants; for a warrant is sent out from the Nilgiris to Mysore and there it filters through the usual channels and in a routine fashion to the constable who because he is in sympathy with the cooly, or because he knows his superiors do not care much, does not arrest even those who can easily be found. I shall probably have to report further on this, but I think that some good might be done if Government were pleased to issue orders to District Magistrates to pay special attention to these warrants and would also address the Darbar to the same effect. To my mind the matter goos deeper than the mere service of warrants and the alleged apathy of the police and if it is to be thoroughly proved would require careful injury into the causes which induce the cooly to desert, and having deserted to conceal himself or to induce the constable not to find him. Some of these causes, such as the disinclination of tne cooly to work, home sickness, or a generally ne'er-do-weel character, lie on the surface but others there may be and probably are which are not quite so apparent.

THE WYNAAD.

From the report by Mr. C. A. Innes, I.C.S., Acting District Magistrate, Malabar, on the working of the Madras Planters' Labour Act I of 1903 in the Wynaad for the year 1910, together with the statement prescribed in G. O. No. 1063, Judicial, dated 14th August, 1909, the following extracts are taken :—

During the year, no cases were instituted under the Act either in the Court of the Sub-Divisional Magistrate, Wynaad, or in that of the Tahsildar-Magistrate. Five hundred and ninety-two cases were filed in the Court of the Sub-Magistrate, Vayitri, and seven cases in the Court of the Shrishtadar-Magistrate, Wynaad.

Including the one case pending from the previous year, there were eight cases in all on the file of the Sherishtadar-Magistrate, Wynaad. Of these, seven were disposed of during the year, leaving one pending at its close. Three cases were compounded under section 40 and the remaining four cases ended in conviction. In two of the latter, the accused were made over to the complainants under section 33 and the accused in the other two cases were ordered to repay the advance money. Of the seven cases instituted, one was by a planter against his maistry and six were by maistries against defaulting labourers' Two estates contributed to these seven cases.

In the Vayitri Sub-Magistrate's Court 144 cases were pending at the end of the previous year and 592 new cases were instituted, making in all 736 cases for disposal. Of these 528 cases were disposed of and the year closed with 208 pending cases.

Thirty-one estates contributed to these 592 cases, against 35 estates in the previous year. No less than 321 of these cases were filed by five estates—Achoor (80), Touramala (78), Chundale (61), Cootacoil (52) and

Puthumala (50). It will be seen from last year's report that four of these estates (Chundale being the excepted one) were responsible for 229 out of 442 prosecutions instituted in 1909, and this year's figures indicate that the same estates continue to make increasing use of the provisons of the Act. I have nothing to add to the explanation of this fact offered by Mr. Wood in last year's report, except that I think that the increase is also partly due to the extension of tea cultivation which is now going on. My enquiries during my present tour in the Wynaad tend to show that the tea industry is now in a flourishing condition, and I noticed yesterday in my march from Lakkidi to Kalpetta that the Chundale estate which like the other estates just mentioned now belongs to the East India Tea and Produce Company, Limited, is being largely extended. This opening out of fresh areas for cultivation of course connotes increased demand for labour and increased recourse to the provisions of the Labour Act.

The subjoined statement gives details as to the complainants and accused in the various cases under the different sections :—

Section 21—1 case	...	labourer against estate writer.
,, 23—1 case	...	maistry against sub-maistry.
,, 24—284 cases	...	160 planter against maistry. 124 maistry against sub-maistry.
,, 30—298 cases	...	30 planters against labourers. 268 maistry against labourers.
,, 36—8 cases		5 by planters. 3 by maistries.

The Divisional Magistrate is new to the Wynaad, and I myself cannot offer any useful remarks based on personal experience as to the manner in which the act has worked during the year. The figures given above however indicate that the planters are making much use of this Act, and from the fact that no difficulties have been brought to the notice of the District Magistrate during the year the working of the Act may be considered to have been fairly satisfactory. From the planters' point of view the most unsatisfactory feature of the Act is presumably the difficulty of executing warrants issued under section 29. Special enquiries were made in regard to this point on receipt of G. O. No. 1083, dated 18th July 1910, and it was reported that on the 1st August 1910, 137 warrants remained unserved in the Court of the Sub-Magistrate of Vayitri exclusive of those returned unexecuted in the 144 cases transferred to the special register in 1908, 1909 and 1910. More than 100 of these warrants were pending with the police in the plains of Malabar, in the Gudalur taluk of the Nilgiri district and in Coimbatore and Salem, and the difficulty of executing them was probably due, in the majority of cases, to the fact that the original description given to the planters about the name of the cooly and his village was entirely false. I am quite unable, at any rate at present, to suggest any remedy for this difficulty. In this connection I may note with reference to the letter of the District Magistrate of the Nilgiris to the Honorary Secretary, Nilgiri Planters' Association, dated 18th March 1910, that in the Wynaad the system of handing over warrants to the complainants to be served through the police is not in vogue. They are usually entrusted to the police for execution. A partial exception however is made to this rule in cases where the complainants make special representations that they can identify the accused. In these cases the covers containing the warrants addressed to the Magistrate within whose jurisdiction they are to be executed are handed over to the complainants for delivery to the Magistrate concerned.

The Planters' Chronicle.

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THE U. P. A. S. I.

(INCORPORATED.)

Death of Mr. R. D. Tipping.

For the first time (May it also be the last!) a chairman of this Association has died in harness. Although Mr. R. D. Tipping had passed away before the last issue of the *Planters' Chronicle* was sent out, news of the sad event did not reach the U.P.A.S.I. office until Monday morning, and confirmation could not be obtained until the afternoon of that day, when an intimation to Councillors was at once despatched. Even then the Secretary was under the impression that Mr. Tipping had died at Hunsur; and the next day, through what must have been a slip of the pen on the part of his informant, the date was fixed as Friday, the 28th ultimo, whereas it should have been Saturday, the 29th.

Since then it has been ascertained that Mr. Tipping arrived back at Pollibetta, from Bangalore, on the evening of the 25th (Tuesday), having motored himself from Mysore. He got through a heavy mail and other work on Wednesday, went to the Bamboo Club in the evening (as was his custom two or three times a week to look into things) and ended with a rubber or two of bridge, which he greatly enjoyed. He was in the best of spirits; but on his return home could not take his dinner. He sat out on the verandah for a time; and then, suddenly, internal hemorrhage set in. On the next day he was a little easier, but at night he had a relapse, and death claimed him at 3-30 a. m. on Saturday, despite all the care bestowed upon him by Dr. Hiley and Dr. Davies.

At the funeral in the evening there was a very large attendance of all classes, including a few friends from Mercara.

At intervals for some months past Mr. Tipping had been ill, and on several occasions the progress of his work was thus interfered with. When at the U.P.A.S.I. office on the 24th ultimo he remarked that he had been much better latterly than for a long time past; and he certainly transacted business with his wonted energy and thoroughness. It is due to his memory to say that illness alone prevented him at any time from carrying on his duties as Chairman with admirable zeal and acumen; in the course of a few months he put in a great deal of excellent work on behalf of this Association; and, as is well known, he also did much for the Coorg Planters' Association.

As Agent in India for Messrs. Matheson & Co., Ltd., he occupied a position of great responsibility, and one that made heavy calls upon him. The prosperity of the estates over which he exercised supervision is, perhaps, the best monument to his ability as a planter and a man of business.

The U.P.A.S.I. has lost a courteous Chairman, whose interest in its welfare was very active, and this loss will be very widely regretted.

Mrs. Tipping is assured of the sympathy of all planters in the calamity which befell her upon such terribly short notice.

The Chairman.

Mr. C. H. Brock, who was elected Vice-Chairman at the Annual Meeting last August, has now succeeded to the Chairmanship.

The Scientific Officer.

There is a possibility that Mr. Anstead's return to head-quarters may be delayed a few days. A desire has been expressed by the Government of Madras that he should visit Ootacamund for two or three days, as soon as possible, in order to give some information regarding the proposed experimental plantation for the hybridisation of coffee.

The Proposed Coffee Cess.

In the official report of the Proceedings of the Mysore Representative Assembly, 1910, there appears the following "summary of discussion" under the head of "Subject No. 116, Cess on Coffee":—

"The North Mysore Native Planters' Association is not in favour of the levy of the cess on coffee which the European planting community in Mysore is urging on the Government of India for the popularization of coffee. If the question should come up before Government, it is requested that the native planters, who form a large majority and own a much greater extent of coffee land than the European community and who also produce by intensive cultivation more maunds to the acre, may be consulted before any decision is arived at. The cess need not be levied as it will not improve prices. Indian planters form only a small fraction of coffee producers in the world and as the prices depend entirely upon the Brazil market, Indian coffee can hold its own, only if its quality is superior. The cess is intended to be applied in advertising it. If it were to advertise Mysore coffee only, there can be no objection.

"There are altogether 140,000 acres under coffee cultivation in Mysore. Of these, 100,000 are in the holding of Indians. They sell most of their coffee locally as they find it more profitable to do so. Many of the small coffee planters are able to increase the produce by intensive cultivation and as the cess is nine pies per maund or three annas per cwt., they will have to pay the cess in a higher proportion. The cess is moreover intended to popularize coffee of every description and not merely Indian coffee.

"*Mr. C. Srinivasa Rao.*—Indian coffee is exported to France and other places. The cess will popularize coffee in England. Messrs. Volkart Brothers and others who buy coffee locally export it chiefly to foreign countries. The cess will therefore mean a loss of price to Indian producers. Removal of all duties on coffee will produce better results.

"*Mr. Crawford.*—Excepting the North Mysore Native Planters' Association, all other Planters, Native and Indian, are in favour of the cess. The cess will not be utilized merely in advertising the coffee in England but all over the world. The money will be given to an advertising firm in England who will do the needful. If coffee is consumed locally no cess will have to be paid as it will be levied only on the exported article. Unless all planters co-operate, prices cannot improve and as the Government of India refuse to take action if all planters do not apply for it unanimously, these differences should not prevail.

"*Reply of Government.*—No proposal has been made to the Government about the levy of the cess and the Association will be consulted in due course, if such a proposal is received."

The disingenuous suggestion of a comparison between the *acreages* of European and Indian owned Coffee plantations is not likely to have carried much weight with the Mysore Durbar. With European planters it will carry none. Of these 100,000 acres said to be "in the holding of Indians," how much is being really cultivated, how much is made up of the pettiest of petty holdings, and how much ought—accept when there is a temporary influation of prices—to be reckoned as *abandoned* coffee land, and as a menace to the Coffee industry of the State? It is such areas, and there are many of them, that constitute veritable breeding grounds and nurseries for pests and diseases. Their owners, far from being allowed a vote in respect to matters of policy, ought to be compelled by law to root out the plants that they have neglected.

It cannot be too often repeated that the whole object of the proposed Cess Scheme is *to advertise* Coffee at the expense solely of the coffee exported from the country, not of that which is consumed in India; and by this means *to bring about a permanent rise in prices.* Carried out successfully, the scheme would raise prices more than sufficiently to cover the small levy imposed, and producers would be gainers, not losers.

Coffee Deterioration.

This is another (No. 1171) of the subjects discussed by the Mysore Representative Assembly last October. The following is the official "summary of discussion":—

"The London merchants are of opinion that Indian Coffee has deteriorated. It is the experience of many planters that the large show of blossoms does not set in properly. Experts may be asked to investigate the causes for deterioration of the quality of Coffee and the failure of the blossoms to set in properly and suggest suitable remedies. Arrangements may also be made for the introduction of new seeds. As Indian planters do not belong to the United Planters' Association of Southern India, they cannot move Mr. Anstead, their Scientific Officer, to study the subject.

Reply of Government.—The subject will be taken up if practicable in due course, but the chances of early action are poor. Try the Scientific Officer specially engaged by the Planters' Association."

It should be remembered that there was a time when the Indian planters of Mysore were represented by the U. P. A. S. I., both the North and the South Mysore Native Planters' Associations having been affiliated to the central body some years ago. It is within their power to resume the old connection, should they wish to do so. Moreover, some of the more important of the Indian Coffee-producers are so represented now, as they are members of (European) District Planters' Associations affiliated to the U. P. A S. I.

Valorization Coffee.

The committee charged with the management of the State of Sau Paulo Government Coffee announced on April 1st, with reference to the sale of 600,000 bags mentioned in Clause 1 of the circular dated February 24, 1911, that the following average prices had been realised. For 300,000 bags Rio and Santos in New York, 12¾ cents on the basis or No. 6 Santos; for 125,000 bags in Hamburg and Bremen, 58¾ pf.; for 117,500 bags in Havre and Marseilles, 73·90 frs.; for 25,000 bags in Antwerp, 74·12½ frs.; for 20,000 bags Rotterdam, 35·40 cts.; for 12,500 bags in Trieste, 71·20 kr. With reference to the sale of 600,000 bags mentioned in Clause 2 of the circular referred to, 300,000 bags Rio and Santos reserved for New York have been sold there at 12¾ cents on the basis of No. 6 Santos. Now further sales will be made in New York this year, and the sale of 300,000

bags, which will be made in Europe on April 22, will complete the total amount of Government Coffee to be sold during 1911. The committee has decided to ship about 200,000 bags lying in London to the United States, in order to replenish the Government stocks in America.

"Coloured" Tea in the United States.

Correspondence relative to the restrictions imposed on the importation of artificially coloured or faced tea into the United States of America has been kindly forwarded by the Government of Madras.

The important papers sent in are the following:—

UNITED STATES TREASURY DECISIONS, JANUARY 26TH, 1911.

Examination of tea under the Food and Drugs Act.

Examination of tea under the food and drugs Act.

Beginning May 1st, 1911, tea imported thereafter must be labelled to show the presence of artificial colouring or facing matter.

Treasury Department,
January 17th, 1911.

To

Collectors and other officers of the Customs:

At the request of the Secretary of Agriculture and upon his representations as to the necessity therefor under the food and drugs act, the department has decided to co-operate with his department to the end that packages of tea artificially coloured or faced shall be so labelled.

I am advised by the Secretary of Agriculture that, beginning May 1st, 1911, all tea thereafter imported into the United States both in large and small packages, must be labelled on each container to show the presence of any artificial colouring or facing matter therein.

This regulation will not apply to teas imported prior to May 1st, 1911.

It is expected that such examination as the Department of Agriculture desires to make under the food and drugs Act to determine the presence of such foreign matter will be made simultaneously with the examination under the tea inspection Act of March 2nd, 1897, in order that there shall be the least possible delay to shipments.

Should special regulations be required to minimise any inconvenience to importers and to secure harmonious co-operation between the two departments under the two laws governing the importation of tea, you will be duly advised.

(Signed) FRANKLIN MACVEAGH,

Secretary.

COLOURED TEA RULING.

Washington March 12th (Special). The Treasury Department has issued the following announcement in regard to the importation of tea:

"Excessive colouring matter in teas shipped from abroad prior to May 1st, 1911, may be removed under customs supervision at the expense of the importers, whether such teas have or have not been rejected on account of the presence of such colouring matter.

"However teas from which such excessive colouring matter has been removed, will not be admitted unless they comply with the law and regulations, in all respects, and, therefore, samples of such reprocessed teas will be submitted to the tea examiner for determination of their quality, colouring matter etc.

"Teas shipped from abroad after May 1st, 1911, will not be allowed entry if they contain any artificial colouring matter at all."

THE PLANTER'S LIBRARY.

"The Cultivation of Hevea."

Reference to the above book was made in an earlier issue (*vide P. C.*, Vol. VI, No. 9, p. 110) and the author's prefatory remarks published therein gave a very fair idea of the scope of the work. Messrs. Stuart R. Cope and A. Content deserve thanks for translating Dr. P. J. S. Cramer's book from Dutch into English, and planters who read the anglicised version will appreciate it.

The author was struck with the extremely rapid increase of Rubber cultivation in the Malay Presidency of late years, and the manner in which they are still extending every year, and he gives figures to prove how enormous this increase has been. In 1908, he states, the Federated Malay States produced 1,413 tons (Custom House returns); by 1,913, he estimates, the yield will be over 22,000 tons. The exported rubber is almost exclusively obtained from Pará rubber trees (*Hevea brasiliensis*), which variety was imported in 1876. Dr. Cramer remarks :—" An error has been made by planting cuttings, which do not form a straight trunk, and in the plantation which I saw maintenance was neglected." But there is little doubt that in these days there is a great deal of careful cultivation and planting going on.

Dr. Cramer's book, which contains a large number of illustrations, starts with " clearing the ground." He discusses, first, the nature of the soil, and even its " original covering ;" then passes on to drainage before taking up the subject of the " germination of the young plants," which he treats under several sub-headings. " Planting " sections bring to a close his chapters on " Preparatory Arrangements," a title that may possibly not have been improved in translation.

" The upkeep of the plantations" calls for four chapters, in which weeding, the use of cover plants, catch crops, methods of growth and topping and pruning, and diseases and pests are all taken up. " Tapping" comes last, five chapters being devoted to it, though the last of these passes on from coagulation of the latex to the finishing of the coagulated rubber as " sheet," " crêpe," " inferior qualities " and " scrap," and the important questions of " smoking " and " packing."

To give an idea of the author's style of stating what he has seen and what he thinks, the following excerpts are taken from the section dealing with " Requirements from catch crops" :—

" One of the points upon which opinions are mostly divided, is the question whether it is advantageous or not, to plant between the young rubber, other plants which will give a profit before the rubber comes into production, and cover, at least, part of the upkeep, expenses and maintenance during the earlier years. On some old estates, where tapping is already being done on a large scale, these are not necessary. The profits which are readily obtainable from catch crops, are not required and it is preferable to concentrate as much energy upon the rubber plantation as possible ; the crop from the older trees is sufficient to cover all expenses, to provide money for extension and to distribute, moreover, high dividends. For younger and smaller estates, it is different ; here we are anxious to find a cultivation which gives sufficient profit as soon as possible, in order to strengthen the capital account and cover the high expenditure for the upkeep of the young plantation.

" When the Hevea is about to mature and come into production—*i.e.* after about 4 to 5 years, or with a wider system of planting perhaps 6 years, —the catch crop must be taken out, the shade of the old Hevea is too close to have another cuitivation beneath it ; perhaps, too, from the point of view

of management there would be objections against proceeding with tapping while at the same time taking care of the catch crop. It is advisable to plant the Hevea out fairly close together in the rows, but with wider distances between the rows; a sufficient number of trees can be planted per acre and will still leave a space for roads where the catch crops can find a place.

"It is advisable not to approach the rubber too closely with the catch crop; a suitable distance is, for instance, 6 to 7 feet on either side of the Hevea rows. There is then no danger of the Hevea suffering from the catch crop or that the latter may be too much over-shadowed by the Hevea and moreover, a large open space on both sides of the Hevea facilitates the control of the maintenance.

"For a plant to be suitable for a catch crop, it must answer the following requirements :—

1. It must not prejudice the development of the Hevea.
2. It must come into production as soon as possible.
3. Its cultivation must not present special difficulties requiring an exceptionally trained labour force; the production must not require a special installation of expensive machinery."

In some parts the author's remarks are merely descriptive of various methods, processes, &c.; in other places, they are critical. That many of them are instructive as well as interesting is not open to doubt. Dr. Cramer has given, in fact, what he purported to give, *viz.*, "A Manual for the Planter," and it is a manual which will repay study by planters outside Malaya as well as within that favoured region. All his conclusions may not be generally accepted, but he has certainly treated his subject in a very sensible way and all that he has written deserves consideration, for it may be described as the outcome of unprejudiced—or, at most, but very slightly prejudiced—personal observation by a man who is competent to form sound opinions.

The English translation is published by the well-known house of J. H. de Bussy, Amsterdam, and the price is understood to be Rs.5 per copy out here. Orders can be registered at the offce of this paper; and there is every probability that if over 100 copies could be ordered at one time a substantial discount could be obtained, reducing the above price. The volume is compact in form and neatly bound; and can be recommended as useful for general reference.

"Notes on Soil and Plant Sanitation cn Cacao and Rubber Estates."

This book has been compiled by Mr. Harold Hamel Smith, the Editor of *Tropical Life*; and Professor Wyndham Dunstan, M.A., LL.D., F.R.S., F.C.S., &c., Director of the Imperial Institute, contributes a very informing introduction, expressing approval of the important principle advocated in the book, *i.e.*, the necessity of close attention to plant hygiene and remedial treatment of diseases in all tropical plantations. This principle is probably accepted, in theory, by every enlightened planter; but there are some who do not apply it in practice as assiduously as is desirable. Here, a man has "no time;" there, he has "no money to spare;" in some cases, he does quite as much of that kind of thing as is really requisite; in others, he is so well satisfied with general results that he is not much interested in hints as to probable methods of improving these. Well, Mr. Hamel Smith only needs a hearing, in order to impress upon the most indifferent the keenness with which he has studied this matter and the earnestness of his belief that planters cannot afford to ignore it. He quotes many authorities—including the Scientific Officer to the U.P.A.S.I., citing some of Mr. Anstead's remarks made when he was in the West Indies as well as some of the advice he has given to planters in Southern India. A "counterfeit presentment" of Mr.

Anstead forms one of the illustrations to the book, which contains the likeness of a number of experts whose opinions on various points are given, besides pictures of plantations, trees, &c., &c.

Mr. Hamel Smith leads up to a suggestion that there should, as proposed by others before him, be an Agricultural College in the Tropics, and—here he proceeds along original lines—that this should be founded as the Tropical Memorial to King Edward VII. As Professor Wyndham Dunstan observes, "the proposal has much to recommend it, and only needs for its realization concerted action on the part of the Governments and planters in the British Tropics."

Every confirmed believer in the principle referred to above would probably be glad to see this suggestion acted upon, and Mr. Hamel Smith may be said to have established his case as regards the principle aforesaid before launching a suggestion which is certainly not lacking in boldness. For the most part, he has contented himself with putting forward the statements of competent men. The first portion of his book consists of a paper submitted by him to the International Congress on Tropical Agriculture held in Brussels in May, 1910. He urges planters to take care of the health of their plants; he would have them compelled by law to do so, if they will not move without such compulsion. He asserts with truth:—"Those who do not pay careful attention to these matters are either too indolent or too selfiish to do so, and such people, being a menace not only to their neighbours, but to the producing centres at large, should be watched and warned. Disease on an estate may cause trouble to the whole producing world, as the man who is careless of himself and his neighbours would think nothing, should he receive orders for seeds, plants, or cuttings, of sending these to all parts of the world, to spread trouble and disease wherever they go. On account of this, many centres at present free of disease, and therefore anxious to keep the trouble out, are kept back because they are afraid to import seeds and plants of improved sorts, as, with all care and goodwill of the exporter, and although his individual estate may be the perfection of healthiness, &c., no one can guarantee that disease-germs from a careless neighbour may not have contaminated his plants as well. Thus this question of estate sanitation is truly an international as well as a local matter." There should be no two opinions about this.

"Stump-pulling," "Green Manures," "Preparation of Plant Foods from Waste Products," and "Inoculation as a Cure for Pests and Diseases" may be specially mentioned among the many interesting "heads" treated by Mr. Hamel Smith. He devotes also several chapters to the cultivation, &c., of Castilloa Rubber and several to the Cultivation of Ceará—two subjects about which there has certainly been far too little written in the past. Then a wealth of information about "Mechanical Appliances" is supplied.

The book is a useful one, though not all its contents are likely to meet with universal approval. Even when dealing with debatable matters, however, Mr. Hamel Smith writes in way to set his readers thinking; and whether he convinces them or not he will no doubt do good.

The book is profusely illustrated, the "personal element" being well represented.

A Coming Book.

Mr. W. Wicherley's "Whole Art of Rubber Planting," fully illustrated, will be published shortly by the West Strand Publishing Co., London, for the *Rubber World*, in which its chapters have appeared serially. The interest created by the articles should ensure a considerable demand for the book. It will be published at 5s., and copies may be obtained in India through the *Planters' Chronicle*. Orders should be booked now.

INDIAN TEA CESS COMMITTEE.

Advertising in America—1910-11.

The following report by Mr. R. Blechynden, the representative of the Indian Tea Cess Committee in the United States, upon the work done during the third quarter of the season 1910-11, has been published for general information :—

India Tea American Advertising Fund.

Season 1910-11.

REPORT FOR THIRD QUARTER.

I beg to submit my report for October, November and December 1910.

NEWSPAPERS.

1. The system of supporting by bold newspaper advertising the introductory work taken up in new centres, has been maintained during the quarter.

2. On account of the necessity of economising to meet commitments in other directions, a number of newspapers were discontinued which we had been using for some time in places where we introduced India tea earlier in the current, or in the previous season. This policy must be continued, as we are periodically moving to new centres, yet must keep the expenditure within fixed limits.

SPECIALTY MEN.

3. Three men were employed for the whole of the quarter and a fourth man for the last two months. As no specialty work can be done during the three weeks preceding the 1st January, it is difficult to compare the results obtained with those of other qnarters. The four men reported an aggregate of 552 stores as having bought 17,055 lbs. of Indian tea.

4. Apart from other conditions making it difficult to compare results quarter with quarter, the relative density of population in the different areas covered constitute an important factor. During the period under consideration two of the men were retained in Kansas and Oklahoma, thinly populated States, though both are growing rapidly ; one man was in the quite Southern Cities of Louisville, Ky., and Nashville, Tenn. ; while the new man worked the three connected towns of Davenport, Ia., and Rock Island and Moline, Ills., where he did quite well. This group is in the only territory usually considered as a likely market for tea of any kind.

DELIVERIES.

5. We were advised of deliveries made to 575 grocers, aggregating 14,477 lbs. On account of the approach of the Christmas trade and of the stock taking that follows, deliveries were in many instances postponed till after these events, but they are bound to reflect the low average of the purchases made by groceries in such territory as we are now working.

POST CARDS AND SAMPLES.

6. As anticipated in my report for the previous quarter, the number of post cards and samples sent out in the three months, shows a check and instead of growing month by month as it had previously done, has begun to diminish.

There were mailed in this quarter as follows :—

	Post cards.	Samples.	Total.
October	36,512	4,909	41,421
November	17,907	7,391	25,298
December	13,196	2,379	15,575
Total ...	67,615	14,679	82,294
Against in 1st quarter ...	112,773	35,562	148,335
" 2nd " ...	117,882	44,624	162,506

7. The reduction is partly due to our stopping all work in this direction for the two weeks preceding and the week after Christmas. The mails are so crowded at that period that there is less attention paid to proper handling and delivery of advertising matter. The accumulation we will deal with in the last quarter, when we will feel the result of the lower average of purchases made by grocers in the shorter mailing lists they must send. Had this not been foreseen we would have had to adopt measures to keep within the limit of the sum available for this form of advertising.

GENERAL.

8. The quarter has been unmarked by any special feature. Work has been steadily carried on, along lines previously laid down, through the less promising parts of the available territory, so that economies could be effected and the expenditure for the season as a whole kept within the limit assigned.

9. The territory covered is all tributary to the distributing cities of the Middle West, but is not of a character to invite the enterprise of tea houses unless pioneered for them. Yet although parts are thinly populated they are growing rapidly and the people are well to do. (The State of Oklahoma increased in population over 100% in ten years). The Southern Cities visited have for years been notorious in the trade for the inferior quality of the teas they purchase, although they are thriving communities now. On account of their very long hot summer these places should afford good markets for tea, as iced tea is gaining in popularity as a summer drink.

10. I have delayed this report as I hoped to have received earlier the official figures showing the imports of tea into the United States for the eleven months ending 30th November. These have now come to hand and I place them against the same periods in 1908 and 1909. I have to point out that the calendar year 1909 included the period of abnormal shipments of tea from London, in anticipation of an import duty being imposed on tea by the United States.

11. Imports of India and Ceylon tea into the United States from United Kingdom and East Indies eleven months ending 30th November :—

1908.	1909.	1910.
14,624,051	19,306,632	18,725,430

The data for separating the imports of India from those of Ceylon tea will not be avaliable till some time in March next.

12. There has been some talk of the large exports of tea in recent months, from the United States to London. This is mainly China black tea of very low grade selling in New York at say ten cents per pound. These exports will probably aggregate less than half a million pounds in all to date: for the five months 1st July to 30th November it was 374,448 lbs. The relatively high price of India tea appears to have little effect on the imports here, so far.

[At a recent meeting of the Indian Tea Association, the Committee had before them a letter, dated 3rd April 1911, from the Secretary of the Darjeeling Planters' Association, forwarding the proceedings of recent meetings of the Association. At one of these meetings, held on the 25th March 1911, a lecture on the cultivation of tea soils was delivered by Dr. G. D. Hope, the Chief Scientific Officer of the Indian Tea Association. It was suggested that this lecture, and the report of the discussion which followed it, should be printed and circulated for information. With this suggestion the General Committee were in accord, and they directed that the necessary steps should be taken.

RUBBER.

Crop Periodicity in Malaya.

In our issue of a fortnight ago we commented upon the monthly distribution of rubber out-turns in Ceylon. The monthly crops from two estates and the monthly exports from Colombo were examined, and an attempt was made to correlate exactly the rise and fall in the crops with seasonal changes in the weather and with foliar periodicity. It was shown that about the months of January, February and March there is a decrease in out-turn, and this was ascribed to the effects of the dry season, when in Ceylon tapping operations have often to be suspended. After a recovery in April or may, the heavy rains during May, June or July interfere with the yield. The second and lesser dry period does not have any effect that can be determined from the statistics, nor has the fruiting period; and a rise in out-turn due to propitious seasonal conditions aud to increase in number and sizes of tappable trees, continues to the end of the year, except that the November crop shows a fall that is probably due to excessive rains.

We cannot expect to find so marked a variation in the Malayan crops, for the good reason that seasonal changes have a much smaller range, the rainfall is more equally distributed, so that the variation in out-turn from month to month is comparatively little. And the range of variation being comparatively so small, such disturbing factors as the irregular resting of trees and the bringing of young trees in to the tapping round make the statistics somewhat erratic. To discover what are the variations, the monthly returns of some thirty-one Malayan companies turning out large crops have been totalled. Of these companies the returns for three years—1908-1910—have been available in four cases, for two years 1909-10 in six cases, for one year—1910—in twenty-one :—

			Total Crops lb.		Increase or decrease lb.
January	...	...	857,258		
February	...	...	843,876	—	13,382
March	...	...	955,795	+	111,919
April	...	...	921,444	—	34,351
May	...	...	949,553	+	28,109
June	...	...	1,004,522	+	54,969
July	...	...	1,139,817	+	135,295
August	...	...	1,140,359	+	542
September	...	...	1,174,497	+	34,138
October	...	...	1,233,159	+	58,662
November	...	...	1,290,285	+	57,126
December	...	...	1,468,286	+	178,001

There is a fall in February, with a strong recovery the next month, and a fall in April. Yet, in spite of this, April shows a good advance upon January, presumably owing to the increase in number and sizes of the tappable trees. From April onwards a rise increases in force until August, when it receives a setback, starting again and increasing its impetus, as it were, to the end of the year. Not shown in the table is a decrease that occurs in January as compared with the December crop, of which the decrease in February is a continuation.

The fall from December to Febrary can be correlated with a decrease in the rainfall, though the latter is not very marked, and at the end of the period with occurrence of wintering and with the shortness of the month of February—a holidaying month. But why there should be such a great

increase in March is not explainable, even by allowing for the rest which the trees receive in February owing to holidays. The decrease in April may be due to excessive rains. Suitable moisture conditions permit better and better crops to be obtained in May, June and July; but the dry-season, if not the setting of the fruits, affects the August crop. After this month the upward move is resumed, not to any great extent during the rains in October and November, there being a slight hesitation during the latter month, then comes a big advance in December, a more desirable month for tapping.

To take the returns of separate companies is to increase the possible disturbing effect of other factors, but by doing so we are able to include some returns for the first three months of the year. There is a purpose in this, for it enables us to illustrate the depressing result on the yield exercised by such unprecedented drought as that through which Malaya has just passed. This is further referred to on another page.

1910.	Labu.	H. & L.	Limggi.
January	12,863	43,176	58,000
February	9,300	40,724	57,000
March	16,000	47,273	63,500
April	14,750	42,265	60,500
May	17,185	38,648	62,500
June	19,134	37,471	63,000
July	16,626	39,266	71,000
August	15,426	39,847	73,500
September	20,548	43,173	78,000
October	20,000	48,253	82,000
November	20,000	49,477	82,000
December	20,500	45,908	82,000
1911.			
January	20,089	49,492	85,000
February	17,872	44,936	81,500
March	14,717	37,402	67,500

These returns are all alike in that in 1910 the months of February and April show decreases on the preceding months, though it must be understood that this is far from being the case with all of the companies whose crops have been totalled. The first of the above companies had an actual decrease in August following another in July, the two others show merely a hesitation in the rise. Upon passing to the statistics for 1911 we find on the whole an increase in January, but afterwards a very marked decrease, the respective managers cabling home that the drought was severe or unprecedented. Of course, this is an exceptional condition, but the figures serve to drive home a point upon which these notes have been formed, that moisture conditions affect the crops.

The quarterly returns for a company situated in the Klang district show a tendency for the crops to increase from the first quarter to the third. In the fourth quarter of each year except 1908, when there was special circumstances that made this quarter the best, there is a fall, which is continued to the first quarter of the next year.

PERCENTAGE OF CROP SECURED IN EACH QUARTER.

	1908.	1909.	1910.	1911.
January—March ...	20·27	15·86	17·74	22·04
April—June ...	24·63	20·45	25·32	(of estimated
July—September ...	25·87	33·65	29·69	crop.)
October—December ...	29·23	30·04	27·25	

—*India-Rubber Journal.*

Rubber in Guatemala.

H. M. Vice-Consul at Guatemala (Mr. G. D. N. Haggard) report that many products of the soil of Guatemala, in which at present there is no foreign trade, might be exported. Among other products of the forests as yet unexploited, such as gums, resins, fibres, etc., may be mentioned a certain wood found in the province of Peten, which is much prized for its buoyancy and is said to possess advantages over cork. Rubber also might be cultivated on a far larger scale were the numerous properties, on many of which wild rubber grows in great quantities, in the hands of persons with capital and knowledge. The native owners, for the moment at all events, seem more disposed to sell these properties than to work them, but they do not know how to get in touch with a purchaser. With the completion of the railway system in the west of Guatemala, and the consequent outlet to the Atlantic by way of Mexico, he thinks that some of these properties might prove a good investment.—*India-Rubber Journal.*

American imports of Eastern Plantation Rubber.

We publish in this issue some statistics that we think will be found of equal interest by the rubber manufacturer and the rubber producer, as well as by the importer and exporter of raw rubber. These statistics refer to the imports of plantation rubber at new York, and they have been compiled with the collaboration of our New York contemporary, the *India Rubber World*, from particulars of arrivals furnished to it. We believe that they will be found reasonably accurate.

It is shown that the New York imports of Eastern plantation rubbers increased from 3,929,500 lbs. in 1909 to 8,509,000 lbs. in 1910. During the same period the output of plantation rubber in the East grew from 4,600 tons to 8,000 tons, so that the American takings not only more than doubled in quantity, but also increased at a greater percentage rate than production. This increase subsisted alongside a similar increase in the American imports of Jelutong and Guatule, while the imports of wild Pará rubber fell off to some extent.

The United States and Carada now take just under one half of the total Eastern production of plantation rubber, and a very interesting situation is thus revealed.

The increase in the imports of plantation rubber to New York will be more readily grasped on referring to our diagram showing the growth quarter by quarter during the last two years. In the first quarter of 1909 the import was only 431,000 lbs; in the second quarter the amount had more than doubled—to 899,500 lbs; and in the third and fourth quarter it rose to 1,159,500 lbs. and 1,439,500 lbs. The year 1910 commenced with an import in the first quarter of 2,044,000 lbs.—nearly five times the amount taken in the corresponding period of 1909—but during the second quarter there was a drop to 1,514,000 lbs., probably a seasonable decline. In the next two quarters 2,469,000 lbs. and 2,482,000 lbs. were imported respectively.

The growth of direct shipments from Colombo to New York is important and is shown in our table. This business has more than trebled since 1909 moving from 549,000 lbs. to 1,720,500 lbs. It is yet too early to say what effect the regular Colombo auctions may have on it.

London, has not, however, much to complain of, and still handles the bulk of supplies, sending to New York last year 5,742,000 lbs., against 3,295,500 lbs. in 1909.

What these statistics teach us is that America is at present the largest consumer of plantation rubber. The number of those who are sceptics regarding the value of the new material is, we verily believe, decreasing

every day. Many manufacturers declare themselves sceptical who probably add an inward reservation to the effect that they have not themselves found out the particular mode of dealing with it. The largest firms in this country are certainly employing plantation rubber in quite large quantities, and in Germany and France considerable amounts are used. The largest French tyre concern buys important quantities.

It is, however, with the American consumption that we are particularly dealing ; the enormous strides the commodity is making there point to United States manufacturers maintaining their reputation for enterprise, and certainly its acceptance in that go-ahead country should vouch for its generally satisfactory character—despite the variability which is its chief drawback at present.

A member of the trade who has recently returned from a visit to America favours us with his views and the results of his enquiries.

He believes that "Plantation" is in general rather than particular use, that it enters into all kinds of goods. Cut sheet and threads, for which it is probably unsuited, are not made to any large extent in America, so that the question does not arise. In fine, it is put to practically every use for which wild Pará is suited, and he thinks that all the large manufacturers are availing themselves of the growing supplies.

The United States Rubber Co. has several times sent directors and representatives to the East to study conditions, and with, it is believed three main objects :—

(1). To make contracts for forward supplies.

(2). To report on the feasibility of acquiring their own plantations.

(3). To arrange purchases upon the local markets, thus achieving a double success—obtaining certain supplies and reducing the apparent amount of competition on the European and Home markets.

The United States Rubber Co. has always been most enterprising in its methods of obtaining raw rubber supplies, and the plan outlined seems feasible. Its search for suitable properties has been the subject of comment from time to time.

The gentleman whose remarks we have quoted thought too much had been made of the objection to plantation rubber on the score of variability and also of nerve. Fine Hard Pará, he observed, is also variable in quality despite statements to the contrary, and he had found it lacking in nerve. He had seen very good lots and quite poor lots of both.

So long as prices are rising, no one makes a grievance of variability discovered in shipments bought to arrive, but in the other eventuality the arbitration bodies are kept engaged.—*India-Rubber Journal.*

Producing Capacity of Plantations.

The producing capacity of plantations in the East has been estimated by various authorities. Mathieu gave, as an estimate of yield in the Malay Peninsula the following: 5 years, 1 lb.; 6 years, ½ lb.; 7 years, 1 lb.; 8 years, 1½ lb.; 9 years, 2 lbs.; 10 years, 2½ lbs.; 11 years, 3 lbs. This estimate is far below the results already obtained, and must be regarded as too low.

Wickham, on the assumption that the trees were planted 33 by 33 feet, estimated the yield at 1 lb. from the fourth to the fifth year, increasing to 25 lbs. from trees 20 to 30 years old.

From yields on Malayan estates, we should estimate on Malaya, the yield per acre at 100 lbs. up to the fifth year, 150 lbs. from 5 to 6 years,

200 lbs. from 6 to 7 years, 300 lbs. from 7 to 8 years, and quite 400 lbs. thereforth. Malayan estates give every indication of being able to yield at the rate of one ton per five acres per annum when mature.

Joseph Fraser cited 600 lbs. per acre from old trees as quite common in Malaya, Seremban gives this in 1909 over 341 acres. In Perak, near Taiping, 121 acres gave 760 lbs. per acre in 1910, and promised 800 lbs. per acre in 1911.

Berkhout (*Tropenpflanzer*, September, 1910), stated that on the Sungei Rengam Estate of the Selangor Rubber Co., 4-year trees produce 60 lbs. per acre; 5-year 90 lbs.; 6-year, 140 lbs.; 7-year 210 lbs.; 8-year 300 lbs.; 9-year 400 lbs.; 10-year 500 lbs.; 11-year 600 lbs.—*India-Rubber Journal.*

Atmospheric Pressure and Yields.

What is the effect upon yields of variation in the pressure of the air is as yet unknown. The behaviour of the tree at high altitudes cannot serve as a guide upon the question, for there other factors have to come into consideration. The atmosphere must exercise its pressure upon the latex in two opposing directions; against the stream flowing out of the cut ends of the latex vessels and upon the trunk of the trees. This latter force must help the latex out of the vessels, with the aid of the force exercised by the tissue tension. At first glance it would appear very much the greater, for it is applied to a larger surface, over the trunk, while the other is applied to only the small cut ends of the latex vessels. But the resistence of the partly unyielding bark to the pressure of the air must render the difference in intensity of the force less in amount. One would welcome observations upon this factor of atmospheric pressure. The variations from day to day in the yields of trees are sometimes marked, and as it does not seem possible to refer them always to changes in moisture conditious, it would be worth while to determine this point. It must, of course, be admitted that the information will not be of any immediate practical value, since atmospheric pressure is beyond our control, but it may throw light upon estate operations wherein pressure is or can be brought into force. —*India-Rubber Journal.*

At a meeting of the General Committee of the Indian Tea Association held at Calcutta on the 11th April 1911, the subject of Importation of Foreign Teas into China was referred to once more. It was mentioned, in the proceedings of the last meeting, that the General Committee had taken action with reference to a rumour that the Chinese Government contemplated the prohibition of the importation of foreign tea into their territories. On the 17th March they approached the Russian Imperial Consul-General, on the subject. They pointed out that such legislation would have a detrimental effect on the Calcutta tea market, as a considerable quantity of tea dust and fannings is exported to Hankow to be made into tablet tea. And they asked if they could be afforded any information as to the accuracy, or otherwise, of the rumoured prohibition. On the 23rd March, the Consul-General replied that he had no confirmation of the rumour. The General Committee also enquired of the Foreign Department of the Government of India, and on the 4th April they telegraphed to Government asking for an early reply. They were without an answer to this enquiry, but they believed, from statements appearing in the newspapers, that the rumours were without foundation.

[Since the meeting the Government of India have telegraphed to the effect that they are instituting enquiries through the Secretary of State.]

SELECTED CUTTINGS.

The Value of Humus.

In those islands of the West Indies where sugar-cane cultivation is carried on more particularly, the agricultural procedure, which is often the outcome of the experience of several generations of planters, shows that the importance of an adequate supply of humus in the soil is generally recognized ; . . . while there is a constantly greater understanding of the need and importance of green dressings.

It is generally understood, by now, that the term humus means to the agriculturist the dark-coloured material, formed of plant remains, that gives the soil its characteristic different colour from that of the sub-soil. The researches of recent years have shown that this material is formed, from vegetable waste, by the action of bacteria in a partial or total absence of air. The circumstances under which it is produced cause more of it to be found in land that has not been tilled for some time than in that which has been turned over regularly ; this condition is met with more frequently in temperate climates than in the tropics. It is a matter of common observation, however, in this part of the world, that the humus content of clay soils is higher than that of sandy soils, bacause the access of air to the interior of the soil is not as great in the case of the former as in the latter ; so that almost ideal conditions for the production of humus are afforded by clay soils.

In dealing with humus more generally, it will be well to treat, in turn of its importance, firstly in relation to the soil, and secondly with reference to the plant. It must not be forgotten, however, that all final effects of humus have a direct or indirect influence on the plant ; for whatever affects the soil must ultimately have its influence on the vegetation which it supports.

One of the most useful effects, to the agriculturist, of the possession by a soil of a good humus content is the circumstance that this improves its texture, so that there is ease as well as economy in tillage operations. The artificial employment of this fact has its largest application on heavy clay soils, in the improvement of their condition by the use of vegetable matter either in the form of decayed remains such as trash, or as withered green dressings. Another matter, to which a passing reference only need be made here, on account of its comparative unimportance in the tropics, is the effect of humus in darkening the colour of soils and thus increasing their ability to absorb heat.

It is recognized by the agriculturist that soils all contain mineral plant food in an unavailable condition. He knows, too, that some of this may be freed in a state in which it can be used by plants, by the employment of artificial dressings such as lime. Humus probably plays the greatest part, however, in this matter, both artificially and in nature. This is because of its power to form bodies, commonly called humic acids, which have a dissolving action on some of the mineral constituents of the soil. The process is naturally slow but is continuous, and its eventual importance in relation to the provision of mineral plant food is obvious, especially when consideration is given to the comparatively small bulk of this food that is necessary to plants.

A final general matter in connexion with humus in a soil is probably of the greatest concern as regards its ultimate effect in enabling that soil to produce quantities of vegetation. This is the circumstance that it provides ideal surroundings to, and a certain amount of food for, the bacteria which effect improvements in the soil, from the agriculturist's point of view. This appears particularly to be the case in relation to the nitrogen-fixing organisms.

Greater recognition of the importance of the extent to which these affect the nitrogen content of the soil is being attained rapidly, and the matter is particularly brought to the notice of agriculturists on account of the comparative difficulty and expense of sustaining an adequate nitrogen content in the land from which they raise their crops.

The next matter to consider is the value of humus in relation to the plant, more directly. In the first place, humus itself contains nitrogen, potash and phosphates, and this is a fact that becomes of importance when the suggestion is made to remove plant waste from the land, to bring in supplies of vegetable material from other areas on which it has been raised. The matter will be considered further, in the former aspect, when the question is raised of the destruction of vegetable matter for the control of pests.

The most important and most fully recognized direct function of humus in relation to the plant is the effect that it possesses in increasing the capacity of soils to absorb water, as well as their ability to hold it when it is supplied to them. It has been considered already that the power of a plant to grow depends upon the existence of several limiting factors, the absence of, or deficiency in, any one of which will interfere with its proper development. Of these factors, as is well known, the one whose absence or insufficiency most quickly shows itself is the water-supply, and the importance of humus in keeping this at an adequate level cannot be underestimated.

The consideration may now be undertaken of some of the more particularized facts in relation to humus. One that has been indicated already is the quick rate at which vegetable matter is lost from sandy soils. This is on account of the easy access of air to such soils, whereby the bacterial action which would lead to the formation of humus is prevented, and oxidation takes place; so that the material is quickly lost in the atmosphere. It is in such soils that the agriculturist requires to exercise the greatest care in regard to the supply of humus, especially as, if this is deficient, any water that they receive passes away almost immediately, through drainage. . . .

Other matters that remain for short consideration in the present relation, are those dealing with what is called "soluble humus," and the connexion between carbohydrates in the soil and the increase of efficiency of the nitrogen-fixing organisms. Soluble humus, it may be explained, is the product obtained by the action of alkalis such as ammonia and soda on the humic acids; there is a large amount of this matter dissolved in the dark liquid that drains away from manure heaps, because of the alkalinity of the contents of such heaps, through the production of ammonia. Much remains to be discovered concerning soluble humus, and it is not yet known what certainty if similar bodies are of direct use to green plants.

The effect of the presence of carbohydrates in the soil, in increasing the power of the nitrogen-fixing bacteria to do the work that is required of them, is probably due to the greater provision of food, whereby there is an augmentation of the number of bacteria present above that which is normal, with a consequent enlargement of the amount of nitrogen fixed. Information concerning the question has been given already; it is receiving some attention, in a practical way, more particularly in Antigua and Mauritius, where experiments on a field scale are being undertaken. Little consideration will show that work of this and similar nature should throw much further light on the matter of the value and importance of humus to the agriculturist.—*Agricultural News.*

The Planters' Chronicle.

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(INCORPORATED.)

The Late Chairman.

The following is extracted from a letter which the present Chairman, Mr. C. H. Brock, has sent to all Councillors of the Association regarding his predecessor, Mr. R. D. Tipping :—

" You have already heard from the Secretary of the great loss that this Association has suffered in the sad and sudden death of our late Chairman, Mr. R. D. Tipping.

" At all times a sound planter, a genial companion, a tactful adviser and a hard worker, his death is a deep sorrow and shock to all who knew him.

" Conscientious to a degree, till the last he always held his duty first and never spared himself.

" Personally I had only met him at long intervals during the past nine years, but the pleasant memories of my few meetings with him only bring home to me all the more strongly how much he must be missed by his more intimate friends, and I feel sure that everyone who claimed his friendship will join me in an expression of our sincerest sympathy with Mrs. Tipping and his family at their irreparable loss.

" He was our Chairman for the past 8 months, and it has come as a great blow to us all that he has not been spared to carry out his term of office, and has left this gap which I have been called upon to fill."

Colonel Hugh Daly, British Resident in Mysore and Chief Commissioner of Coorg, has caused an official expression of his regret at the death of Mr. R. D. Tipping to be communicated to the U. P. A. S. I.

The Proposed Scientific Department Scheme.

MEMORANDUM BY THE LATE CHAIRMAN.

Shortly before his death the late Chairman discussed the above scheme thoroughly with the Secretary and authorised circulation of a memorandum, copies of which have since been sent to the Honorary Secretaries of District Planters' Associations for delivery to every member of each of those Associations.

Some portions of the memorandum were confidential ; other portions will perhaps prove of general interest, and it seems desirable to place them on record in the pages of *The Planters' Chronicle.*

Hence, the following extracts are given :—

" Since the Scientific Officer took up his appointment in May 1909, the work of the Scientific Department of the U. P. A. S. I. has, as was antici-

pated, increased by leaps and bounds, and it is no longer possible for one man to carry it out, even on the lines upon which the work is being done at present, a fact that goes to prove how highly the services of the Scientific Officer are appreciated. The district under the U. P. A. S. I. which thus falls to his lot comprises a huge piece of territory, and the consequence is that this officer is kept constantly on the move. In his annual report last year Mr. Anstead stated that during twelve months he had travelled a distance of 4,800 miles by rail and 1,800 by road. In addition to this over 200 letters had been dealt with and articles had been written each week for the *Planters' Chronicle.* This work has now increased, the distance travelled during this year will be greater, while the office work has doubled. It will be seen, therefore, that it is impossible for one man to carry on and the Scientific Officer is being more than overworked.

"There is also another, and a more important, side of the question, and that is that a highly trained man with many years' experience of tropical planting is wasted in being kept constantly touring round districts giving advice and dealing with matters which could be done by a man possessed of lower qualifications and drawing a smaller salary. To put it shortly, the planters are not getting out of Mr. Anstead the full value that he ought to be placed in a position to give them, but are merely overworking him.

"His own idea is that he should be given time to take up the definite study of special problems, such, for instance, to name only a few, as when to apply manures to Coffee and what are the best manures to apply; how to control 'Black Rot' of Coffee leaves; the best way to manure Tea; how to control Rubber diseases and the best methods of tapping. These are only a few of the many things planters want to know about, and the things a Scientific Officer was obtained to discover. To work out problems like these it is necessary to have two things, firstly, leisure to work uninterruptedly and, secondly, someone to conduct and carefully watch field experiments. Consequently, if the Scientific Officer is to be used to the utmost of his ability and efficiency planters must relieve him of the burden of constantly touring, and give him leisure to work at headquarters.

"It is not intended that he should not tour at all, since it is believed that to travel about the country and see planters personally, and to lecture is a most important part of his work, but this should not be allowed to absorb more than three or four months in the year at the outside.

"If the Scientific Officer were provided with Assistants, resident in the different districts or groups of districts, they could do much of the work that the Scientific Officer now does. They would be directly under his control and would carry out his intructions, and would be able at the same time to conduct experiments, and supervise them personally, and so demonstrate to planters in the field the best way to handle local crops and problems, a most important part of the work of any Scientific Department, which is under existing circumstances perforce neglected.

"In any case something must be done, since it is quite impossible for Mr. Anstead to go on doing as he is doing now, even merely from the point of view of his health.

"A six-anna an acre cess made over to the U. P. A. S. I. would provide the necessary extra staff both in the districts and at the head office. . . . What does this mean? As an investment it means a small outlay for a big return. It means for Tea planters one extra pound of made tea per acre, and surely they believe that Scientific advice can increase the yield by that amount.

"In the Annual Report of the Indian Tea Association the Chairman stated:—

'In the three years ending 1900 the average crop of tea per acre in India was 418 lbs., in the three years ending 1903 it was 400 lbs., in the three years ending 1906 it rose to 449 lbs., and in the three years ending 1909 it further advanced to 487 lbs. Though absolute accuracy cannot be claimed for the production figures, they are sufficiently close to the facts to form a reliable index of the yield per acre. It is, I say, noteworthy that since the operations of the Scientific Department had time to take effect the level of the six years ending 1903 has been surpassed by 11 per cent. in the three-year period ending in 1906 and by 20 per cent. if we take the average of the three years ending 31st December, 1909. I shall not attempt to estimate exactly how much of this is due to the work of the Scientific Department. We know that there have been various other influences, climatic and economic, in operation, including a gradual increase in the use of fertilisers, but I regard it as beyond question that a substantial part of this increase in productivity is attributable to the improved methods of working which have been popularised by the Scientific Officers. Then in the department of manufacture important improvements now generally adopted in connection with fermenting and firing have enabled producers to materially improve the quality of tea. When it is remembered that 3 pies per lb. on the Indian crop equals 40 lakhs of rupees per aunum, and that even 5 per cent. increase on the average yield of the six years ending 1903 represents, at the prices now ruling, an annual revenue of about 45 lakhs, some idea may be gained of how even small improvements in yield or quality affect the industry. I do not forget that there is another aspect of increased production, but happily there is no need to consider it seriously to-day. Grants from the Imperial and Provincial Government for a further period of five years, for which we are grateful, together with subscriptions from the various branches, and from this Association, will enable us to formulate a programme of work with some hope of continuity. In connection with this we must take care that the aim of applying Scientific research to practical ends is not lost sight of.'

"For Rubber planters the proposed cess means little or nothing. The discovery of how to control Pink Disease has saved the money asked for ten times over already. On Coffee planters the cess would fall more hardly, but it is considered that if six annas an acre less be spent on manures and cultivation and additional scientific advice procured for this amount, it may be trusted to show how to save more than this. That it can be done may be gathered from the fact that the President of the S.M.P.A., in his address at the Annual Meeting of that body in 1910, said: 'I may mention I have already heard one planter say that by taking Mr. Anstead's advice on a matter of cultivation he had made a direct saving of over a thousand rupees in the past season's work and that his property in no way suffered by the economy.' This would have been a high rate of interest on a six-annas an acre cess.

"The present appears to be an excellent opportunity for thoroughly organising the Scientific Department and making it one of the greatest benefits that the Planting Community have ever received, and should we lose the chance now there is a probability of the good foundations laid up-to-date being left to fall into decay; for there is certainly a risk that the assistance given by Government will be withdrawn at the end of Mr. Anstead's present term of office should planters show themselves indifferent to the help that has already been placed at their disposal. . . . .

"It must be borne clearly in mind that if any District Planters' Association should agree to subscribe on the 6 annas an acre basis, it would be relieved of its present subscriptions to

the U. P. A. S. I.
,, Scientific Officer Fund
,, Laboratory.

"Consequently the gain in income on the part of the U.P.A.S.I. would only be the amount of the 6 anna assessment *less* these subscriptions.

"Again, if even one Scientific Assistant is added to the staff, an increase of the Office Establishment will be imperatively necessary.

"On being asked to give an idea of the additional work in the U. P. A. S. I. office, which would be involved if an Assistant Scientific Officer were appointed, Mr. Anstead commented on several points. For instance, that an Assistant, on first arrival, would not know what had been done in the past, and would be constantly applying to the Head Office for information. In order to keep in touch with the Scientific Officer and to enable that gentleman to efficiently control and direct his work, the Assistant would have to send in weekly reports, which would need to be commented upon and replied to. Before investigating any pest or disease, he would have to send for records of all that had been done and all that was known about it up-to-date, thus throwing an extra burden of correspondence on the Head Office. When more than one Assistant was at work, it would often be necessary to keep them individually informed of what each was doing or had done in connection with a particular problem.

"Again, it is very likely that, with the advent of Assistants, *The Planters' Chronicle* will become a more valuable and a larger paper, which again implies more work for the Head Office. The records of that office would certainly increase in number and value, and to obtain the full value from them they would have to be systematically filed, and arranged, a work which it is impossible for the present staff to carry out. Mr. Anstead remarks that the present staff is only just sufficient to deal with the mass of correspondence, etc., which daily passes through the office, and any increase in this correspondence, which is bound to come with the increased Scientific staff, must be met with an increased Secretarial staff. . . . . . .

"The adoption of this scheme would, as pointed out above, necessitate additional expenditure at headquarters, where extra work would have to be done. Therefore, when estimating the cost of each Scientific Assistant to be added to the staff, allowance must be made for the cost of enlarging the headquarters establishment and organising it to cope with the greater burden of work so as to permit of the maximum advantage being derived from the labours of the members of the Scientific Department.

"Mr. Anstead wishes it to be stated that he would not be able to deal with this extra work by himself: he would look to the Secretary to relieve him as far as possible of correspondence and all detail work not of a technical character. He would wish to be free to devote his full time to the Scientific work for which he is engaged; and it is obvious that the Association could not reap the maximum of benefit from his labours unless he were set free to act in this way.

"Both he and the Secretary desire that any developments that may be decided upon should be carried out with the strictest regard to Economy, but, above all things, they wish to secure Efficiency and not to see the value of Scientific work impaired because of insufficiency of funds wherewith to execute them properly."

Scientific Officer's Papers.

No. lxiii.—An Address delivered at a Special Meeting of the South Travancore Planters' Association held at Quilon on Saturday, 6th May, 1911.

Mr. Chairman and Gentlemen,—It is with pleasure that I have been able to visit the District of South Travancore again after an interval of a little over a year, and it gives me additional pleasure to be able to meet you here to-day and to have the privilege of addressing you.

Since my last visit one great advance at least has been made which profoundly affects this district, and that is the success which has attended the efforts to control the Pink Disease of Hevea Rubber. The method of painting the trees with Bordeaux Mixture which has been described in detail in the *Planters' Chronicle* (Vol. V, p. 210, and Vol. VI, p. 98) may be described as a complete success, and, if it is carefully and systematically carried out, it will almost entirely prevent the trees being attacked by this disease, which in the past has caused considerable loss. Full advantage should be taken of this method in the district, and all the trees in any zone liable to attack should be painted before the monsoon sets in. The cost is trivial compared with the loss which may be suffered, and which has been suffered in past years; it works out at about one rupee per acre. On steep land it may cost a little more than this, but it will be very little more. When it is remembered that the loss of a three or four years old Hevea tree means a matter of five or six rupees at least it will be seen that the method of prevention recommended is a very cheap one.

Much of the rubber in the district is now being tapped, and I would call your attention to one or two small points about tapping which make all the difference between good and bad work. Whatever system of tapping is adopted the object is to obtain as much latex as possible with the least expenditure of bark. To do this each cut made should be of exactly the same length and at the same angle to the main channel. When marking out the tree, guide lines should be put in on each side to control the length of the cuts and each cut should start at the guide line and be continued to the centre channel. There is a tendency not to do this but to begin the cut at varying short distances from the guide line, and this results in a waste of bark, an uneven margin of untapped bark being left beside the guide line. It is also important that the cuts should be parallel, and there is a great tendency to make them more and more sloping, the result being that when the bark is tapped out and the original cuts meet so to speak a triangle of untapped bark is left in the corner near the guide line. This triangle is of varying area, depending upon how much the original slope has been exaggerated, and needless to say it is bark wasted. In order to overcome this fault, which is a common one, I would suggest that a light guide line be put in when the trees are marked at intervals of an inch between the original cuts. Thus, if the original cuts are eight inches apart, there will be seven of such guide lines between each pair of cuts and these will not only serve to guide the tapping cooly but will also make it easy for the supervising manager to detect any tendency to get out of the parallel.

Now that tapping is becoming general, it is a platitude to say that every precaution should be taken not to cut or wound the cambium, but it may not be out of place to remind you that the actual parings should be made as thin as possible, and twenty cuts to the inch is a goal to be aimed at.

In connection with the actual manufacture of rubber I would repeat the warning which I gave here last year, that absolute cleanliness in the factory, and of collecting cups and all vessels which at any time contain the latex, is essential to the making of clear biscuits. Thorough washing at the time of rolling and a plentiful supply of good clean water are also necessary.

In Tea, the most important disease prevalent in the district is Mosquito Blight, and with regard to this I have nothing to add to the advice I had the pleasure of giving you on the occasion of my last visit. I would insist that it is advisable, and profitable, to carefully follow out the methods recommended by Mr. Antram for the control of this pest.

The long drought experienced this season has caused the attack of Purple Mite to be worse than usual. This is a disease which causes the old leaves to assume a purplish-bronze-like colour, and many of them fall off. The consequence is that when the rains come the resulting flush is delayed. The under sides of these attacked leaves, and especially the margins, will be found to be thickly covered with minute white specks, which are the cast skins of the insect causing the disease, a minute Mite, rejoicing in the scientific name of *Phytoptus carinatus.*

The remedy is to dust the bushes at the beginning of the attack, in January or earlier, with flowers of Sulphur. This should be done in the early morning when the leaves are wet with dew, as then the sulphur will stick readily. It is most economically applied by means of a blower, a sprayer that is designed to apply dry powders in a fine cloud, but it can also be efficiently applied by shaking it through perforated tins, or through a gunny bag. About 50 to 60 lbs. of Sulphur per acre is required when the attack is bad. The remedy is simple, and I have seen several cases where it would certainly be advisable to adopt it.

Stump Rot is also prevalent among the Tea in the district, and I strongly advise you to remove all dead *Grevillea* stumps as soon after their death as possible. This is easily done by using a stump puller, and though expensive work at the time it is economical in the end. I would also warn you against *Albizzia* stumps, which also cause and spread the disease.

I am still a firm believer in the use of Leguminous plants and cover crops, but I have changed my opinion a good deal as to the value of *Passiflora*, not because it is a bad cover crop, but because it is difficult to control. *Cassia mimosoides* and *Tephrosia purpurea* are probably the two best plants to use for the purpose, and seed of the latter can be obtained in quantity through the U. P. A. S. I. Office if sufficient notice is given beforehand.

With your permission, gentlemen, I should now like to say a few words about the scheme which is before the U. P. A. S. I. to appoint Assistants to the Scientific Officer. At your last annual general meeting you expressed the opinion that such an Assistant was not at present necessary in Travancore. I beg to totally disagree with you in that opinion. The district is dependent upon Tea and Rubber, and for both crops many very important things remain to be discovered. The time is coming, indeed it has come, when Tea must be manured, and beyond the fact that we know a well balanced general fertiliser produces a marked increase in yield we know nothing at all about the most suitable manures for Travancore soil and climate. To find this out needs careful, systematic, experiments carried out on the spot, and that implies at once scientific control. Again, the diseases which yearly reduce the crop and the profits should be studied carefully by some one on the spot. In the case of Rubber we have practically everything to discover: the best manures for it, how to handle it, and how to smoke it.

Now, gentlemen, I cannot work out these problems for you, because the whole of my time is at present being taken up in travelling about the country. During the past year a laboratory has been established for me in Bangalore, and now I want time to use it. I am constantly having to say that I do not know to most important questions which are asked me, and I am given no time to find out. The whole of my time is spent travelling about the huge district under the influence of the U. P. A. S. I., and leaving the possibility ot my being able to continue this work, which is a big strain upon health, out of the question, I contend that it is an unprofitable way of using your Scientific Officer. What is needed is a number of Assistants, resident locally in the various districts, who can relieve me of this constant travelling, and who can undertake, and carry out, experiments under my control, and study diseases in relation to their local conditions. It would then be only necessary for me to visit the various districts occasionally, and I should be set free to undertake research work and to study the many problems before us, backed up and aided by scientifically trained men in testing results in the field which have been obtained in the laboratory.

Such a scheme is before the U. P. A. S. I. and details of its exact cost and working will probabiy be shortly put before you through the medium of the *Planters' Chronicle*. Our late Chairman had recently had the matter in hand and was to have issued a circular letter on the subject, and possibly the last piece of work which we shall receive as a legacy from his able hands will be this letter dealing with a matter which he had close at heart. I trust that you will give the proposal your closest attention, gentlemen, and carefully consider whether the time has not arrived when the U. P. A. S. I. should build up a properly organised Scientific Department, and if so what part this Association is going to take in such a building. The matter will be before the Annual Meeting of the Association this year in Bangalore, and I hope that the South Travancore delegates will come to that meeting prepared to further the scheme, and to put the United Association on a firm footing, equipped with a Scientific Department consisting of more than one man. I assure you that such a Department is badly needed, for the present system cannot continue, and I feel confident that any money spent upon such a Department, and upon properly organised scientific advice, will prove to be a very good investment.

In conclusion, gentlemen, I shall be happy to take part in any discussion which may arise from this address, or to endeavour to answer to the best of my ability any questions you may desire to put to me.

RUDOLPH D. ANSTEAD,
Planting Expert.

JAVA COFFEE IN 1911.

The German *Nachrichten fur Handel* notified recently, on the authority of the German Consul at Batavia, that the total production of coffee in Java this year, under State control, is estimated at 24,887 pikuls, whilst the figures for 1910, 1909 and 1908 are 31,317 pikuls, 32,277 pikuls and 82,190 pikuls respectively. It will thus be seen that the estimates of the forthcoming crop are considerably below the results of the crops for 1910 and 1909, and very greatly below those for 1908.

Pikul=133½ lbs.

RUBBER.

Rubber in Dutch Guiana

(AND OTHER THINGS).

An interesting series of letters is being contributed to the *India Rubber World* (New York) by its Editor, who has a happy knack of mingling the picturesque with the practical and of conveying information in an attractive way. It will be seen that the following extracts include some of his digressions from the precise subject of "India-Rubber in Dutch Guiana," but probably this will be pardoned in view of the interest of the narrative, even in its present mutilated form. These extracts are from Mr. Pearson's fourth letter.

"One of our morning trips was to a large cocoa plantation, La Liberte, owned by the Balata Man, to see his plantings of Pará rubber.

"The little steam launch *Ellen*, moored to the slippery tide-washed steps of the Club House *stelling*, was our meeting place soon after early coffee. Then, as she chugged up-stream against the outgoing tide, we had breakfast on the little awning-covered quarterdeck. The plantation was about an hour up the Suriname, and had a substantial landing pier, down which a flight of steep wooden steps ran into and under the water, the last three or four steps being always coated with river slime. This plantation had once been a great sugar estate, the grinding being done by a tide mill. The present owner had bought it for coffee, and that not being profitable enough he had turned to cocoa. A most productive and beautiful estate was the result, until suddenly the dreaded witch-broom made its appearance. When the cocoa tree throws out green shoots of three or four times their normal diameter, adorned with abundant leaves twice as big and twice as glossy as the rest of the tree bears, that is the witch-broom. It sucks the vitality from the trees until it stops fruiting. The disease is said to have had its beginning in the Guianas and has spread like wildfire and done incredible damage. By pruning and spraying it can be cured, but the menace of its presence is turning more than one cocoa estate into a rubber plantation. Our host, like a true fighting Dutch-man, had no thought of abandoning his profitable cocoa, but was curbing the pest with one hand and planting rubber with the other. He was also planting bananas, as the ubiquitous fruit company have a long time contract for many thousands of bunches from this territory, and every Dutch boat going north carries its quota. The bananas were interplanted with young *Hevea*, drawn from a nursery of 25,000 trees that had some time before been established on the estate. It seemed odd, but the seeds for the planting came from far away Ceylon. One would imagine that Guiana's near neighbor, Brazil, with *Hevea* seeds rotting on the ground by the hundred-thousand, would be the natural source of supply, but such is not the case, and seed shipments of from 20,000 to 1,000,000 are constantly made from the Far East. They cost about a cent apiece on arrival, and sometimes 5 per cent. of them germinate and sometimes 95 per cent. That depends upon care in gathering and storing, and packing, and in a measure on the season of the year in which they take their journey. It is affirmed by planters that seeds that come by way of England in the cold weather suffer most.

"There were two systems of canals on this estate—the drainage canals with flood-gates housed under trim brick porticos standing sentinel along the river bank; and a wide traffic canal that divided the plantation in half, together with several lengthy laterals, giving easy access to all parts of the estate. . . .

"From the forest ride we emerged into a great clearing given up to bananas and rubber. I don't know much about bananas, so the discussions concerning the Suriname disease, a swelling and rotting of the tissues, a sort of vegetable *elephantiasis*, or the Panama disease, a leaf blight, did not vitally interest me. . . .

"The *Heveas*, which were about a year old, looked very well. The soil in which they grew is said to be about 60 per cent. clay and 40 per cent. fine sand. It is really Amazonian mud and holds the moisture wonderfully. The drains between the dykes were from five to six feet deep, so that during the rainy season the trees have at least four feet in which to grow without getting their feet wet. Apropos of this the Government Official spoke of eight year old *Heveas* on drained and undrained land. Both grew very well, but while the trees on the undrained land were 20 inches in circumference those on drained land were 30.

"This special planting of bananas and rubber amounted to about 2,800 acres, the rubber trees being planted 100 trees to the acre, and it took long to look it over thoroughly. We got home just at dark and promised to be ready for an early start on the morrow for the Pará river.

"The dwellers of the beautiful rubber city that dominates the mouth of the Amazon no doubt believe that the word Pará is exclusively their own. It may come to them as a shock, however, to know that there empties into the Suriname river a genuine tropical stream that bears the name of Pará. It is in many ways a miniature Amazon with high-water marks far up on the tree trunks, masses of floating vegetation borne along by the current, with floating trees and logs that had to be dodged or dislodged; it was very like the Mightiest of Rivers. Then, too, the tree growths of palm, silk cotton, and the variety of hard woods with their small leaves and mighty branches, with the ever present and luxurious monkey vine, binding the trees so firmly together that no forest monarch could fall without pulling down many lusty neighbors. The one touch of Amazonian similitude most common, however, was the rankly growing "mocca-mocca," with its huge arrow-headed leaves pointed straight upward, filling every muddy shallow and crowding as far out into the stream as the swift water would permit. Around many curves, under leaning tree trunks, through masses of drift, by little cocoa and banana plantations, we pushed on upstream until we reached the mouth of the great canal that joins this river with the Suriname some miles above its mouth. We turned and steamed through this canal out into the muddy waters of the Suriname, past the Leper colony and across to the Accarico (Crocodile) plantation. . . .

"This plantation, so said the Government Official, had considerable good rubber, and we started out to find it, but almost at the outset met with a temporary check. Between us and the rubber field yawned a ditch some fifteen feet deep, with a little water and considerable mud in the bottom. It was bridged by a square log about twenty feet long and six inches wide, across which our guide, his dogs and coolies paced as calmly as if it were Brooklyn bridge. The Balata Lady pluckily faced it and would have walked across, although in fear and trembling, but the Balata Man would not allow it and bade us go on and not wait for them. While we tarried for a moment, the manager produced two long poles, which were hastily stuck down into the mud by the side of the bridge, then placing a coolie on the bank at each end, who held another long bamboo pole for a balustrade, we all crossed in safety. In reality, this balustrade would not have saved one from falling in the slightest degree. It was simply the moral effect of its presence there that enabled the dizzy ones to walk straightly and safely.

"Here we saw some splendid rubber, *Hevea* $2\frac{1}{4}$ years old. There were some 1,200 acres of it, planted 100 to the acre, in distinctly clayey soil, which was, however, well drained. In addition to this, in another direction, were some 6,000 seedlings, that appeared to be six months to a year old and which looked very healthy. . . .

"Quite near here is the Waterland estate, already mentioned as having the oldest *Hevea* trees in the colony. They are only eight in number, and are used as seed producers, and while we were there were producing at the rate of 1,500 seeds a week, all of which found ready sale.

"The plantation of Voorburg lies down the river from Paramaribi, and, like most of the great plantations, must be approached from the water. We journeyed to it in the *Helena*, a little steam launch named after the Balata Man's wife. This estate, an old one with some 1,500 acres under cultivation, was years ago a great sugar producer. To-day it grows coffee and cocoa, and if it fulfils its promise will soon be a notable rubber producer. The place was beautifully administered, and after examing the factory where the coffee and cocoa were prepared for market, we found a conveyance awaiting us for an examination of the plantation itself. . . .

"We passed through the carefully tended cocoa and coffee plantings to quite an extensive field of two year old *Heveas*, interplanted with bananas. Then we went to the older planting, which consisted of 20,000 trees. These were planted 10 x 10, and were very healthy and strong, and for a guess would run from four to six inches in diameter three feet from the ground. The soil in which they grew had been used to produce sugar, then coffee, then cocoa. The drains that lay about five feet below the surface were so dry that one could walk in most of them without dampening the shoe soles. In spite of this, the surface soil on the tops of the dykes which had been exposed to the tropical sunlight for a month without a single shower when turned up with the point of an umbrella was gratifyingly moist.

"The trees were planted from stumps, some of which were two years old before being cut back, but they grew just the same. Close by was a thrifty planting of *Funtumia*, by far the most beautiful of any of the rubber producers. . . .

"From Voorburg we went down the Suriname until in full sight of the sea, then up the Commeowyne by huge sugar estates with their little settlements clustered along the river banks, passing an occasional fruit barge steered by coolies with huge sweeps, who anchored when the tide was against them, and ate and slept, then when the tide turned used it instead of motive power to take them to their destination. There were other craft, to be sure, dugouts, sailing canoes, tent boats, and an occasional steam launch, but the river was fairly free of traffic and the big blue cranes and snow white egrets flapped slowly out of the way, as much at home and almost as fearless as they were when settlements were unknown. Dinner time came as we were still steaming up the river, and we enjoyed a substantial repast. The meal was scarcely finished when the anchor was dropped off Katwyk. It was low tide, and the tender took us to the landing steps.

"The plantation named was not our objective, which was Wederzorg, an old and beautifully kept place that had been under cultivation for 50 years. The manager was absent in Europe, but his assistant willingly showed us the rubber, of which he had plantings of all ages from six months to four years. He had, for example, some 650 acres planted from one year old seedlings, the trees themselves being now four years old. They looked fairly well, but were beginning to show slight signs of suffering from the drought. (As the rains began three days after our visit, it is doubtful if they were

seriously injured.) The trees were planted without any shade, and many of them from slips from older trees. These did not show the vigor or good growth that was apparent in the seedlings. At the time of our visit the manager was interplanting coffee with the whole of this *Hevea* growth. Another field that was shown on this estate was an interplanting of bananas and *Hevea*. Both looked well, the young *Hevea* showing vigorous growth and the banana trees being the largest we had ever seen. The manager complained, however, that they were not bearing fruit, a very serious calamity, and one for which he could find no apparent cause.

"On this estate as well as on most of the others the canals and waterways were clean and sweet. Of course, where vegetation is so abundant they become choked with sediment and vegetable growths, but about once in two years they are drained nearly dry, closed at each end and gangs of coolies set to work shovelling the accumulation out.

"It was late in the afternoon when we reached Pieterzorg. Here we had time only to examine the seed beds, where were growing some 3,000 *Hevea* seedlings that as soon as the rains began were to be set out on the plantation proper. We wanted to stop and look over the plantation, the old fashioned garden, the quaint manager's house, and substantial looking laborers' quarters, but night was falling, we were far from home and tea was ready on the launch, so we re-embarked and headed for the city.

"To the American mind labor in Dutch Guiana is very abundant and very cheep. On the latter point the British planter in the Far East is not by any means in agreement. His labor costs him something like fifteen cents a day, whereas the same labor in Dutch Guiana costs 40 cents a day. This is, of course, the coolie labor, English and Javanese, brought here under the indenture system from India and Java. The English or Tamil coolies are brought in under the familiar five year indenture contract and make excellent workers, many of them remaining at the expiry of their contract as permanent settlers. They are industrious, saving, and become in a small way property owners in a short time. They live simply, contented with rice and cassava, never abandoning their native dress of turban, tunic, and loin cloth, regularly spattering the white of the tunic with magenta stain during festival seasons. Their women wear the heavy silver bracelets, anklets, and gold nose rings just as they do at home. They are wonderfully polite, and their dignified *Salaam, Sahib* is very grateful as contrasted with the often stupid stare of the negro who has grown up on the soil.

"The Javanese coolies are also very polite, invariably greeting the stranger with the soft intonation that makes the coolie speech so grateful to the ear, their greeting being *Taba Tuan*. They are not, however, so desirable either as laborers or colonists as the Tamils. They are perhaps brighter and more active, but have no care for the morrow. The most of them will spend their weekly wage for one meal and then live on scraps and stolen bananas until the next pay day comes around. They are fiercely jealous, and when a neighbor, either black or white, steals one of their women, are quite likely to kill him. These summary vengeances are often accomplished before the crowd of stolid coolies, who not only will not lift a hand to interfere, but who display a lack of memory on the witness stand that would make an American Sugar Trust Official green with envy. Aside from this they are very law abiding and the most willing and courteous people in the world. Their indenture system is about the same as that under which the Tamil coolies are employed.

"Close by the city and jutting out into the river is the fine pier of the Balata Co., where there is 26 feet of water at low tide. Back of it are

warehouses for balata and suplies and a little further upstream a miniature shipyard, where the company build their own boats for the river traffic of the interior."

Prevention of Rubber Theft.

PROPOSED AMENDMENT OF CEYLON ORDINANCE.

"To include manufactured articles in the definition of rubber."

Last night's *Gazette* contains, says the *Ceylon Observer* of April 22, 1911, the draft of a proposed Ordinance to amend "The Rubber Thefts Prevention Ordinance, 1908." It is a short Ordinance, and its object the Hon. Mr. Walter Pereira,Acting Attorney-General, says:—is to place "rubber" as defined by the principal Ordinance on the same footing as "wet rubber" as regards the offence created by section 16 of that Ordinance. "Rubber" and "wet rubber" are separately defined in the principal Ordinance, and, in-as-much as manufactured articles wholly or partly made of rubber are expressly excluded from the definition of "rubber," there is no reason why the penal provisions relating to the unlawful possession of "wet rubber" should not be extended to such possession of "rubber." In prosecutions for the unlawful possession of "rubber" miscarriages of justice have occurred owing to the difficulty of adducing positive proof of the fact that such rubber was stolen property.

We quote in full the section which it is proposed to substitute for section 16 of the principal Ordinance:—

16. (1) Any person who is found in possession or charge of any rubber or wet rubber which is suspected to have been stolen may be charged with being in possession of rubber which is reasonably suspected of having been stolen; and if such person does not give an account to the satisfaction of the Police Magistrate as to how he came by such rubber or wet rubber, and the Police Magistrate is satisfied that, having regard to all the circumstances of the case, there are reasonable grounds for suspecting such rubber or wet rubber to have been stolen, such person may be convicted of an offence under this Ordinance.

(2). Where any Police officer or peace officer finds any person in possession or charge of rubber or wet rabber which he suspects to have been stolen, such rubber or wet rubber may be seized, and such person may be brought before a Police Magistrate and charged as aforesaid.

(3). Upon a conviction under this section the Police Magistrate may direct the rubber or wet rubber in respect of which the accused was convicted, if the same has been seized, to be restored to any person who he is satisfied is the lawful owner thereof, otherwise he shall order the same to be forfeited.

(4) An appeal shall lie to the Supreme Court from every conviction or order under this section, the provisions of section 335 of "The Criminal Procedure Code, 1898," notwithstanding.

The Latex of the Goat.

Mr. Alfred De Berry, in the *Financial Times*, tells a delightful story of rubber experiments in Mexico: "Among new rubbers, Dr. Dolby has several examples which he mentioned to me, and Dr. Montaloo, of Coatzcoalcos, has a rubber he promised to send me. Amusing tales were not wanting, one of an expert who had been collecting a bottle of latex from a plant. Being tired he agreed to pay 50 cents per bottle to some Mogos for more of the latex. Several bottles were brought in, and three were sent to London for analysis, only to result in an amazed inquiry as to what tree yielded goat's milk. Mogos do funny things in Mexico."

SELECTED CUTTINGS.

The Electrification of Crops.

Why do plants look so astonishingly well after a thunderstorm? The various experimenters who for 170 years have been endeavouring to apply electricity to plants have clearly been convinced that they benefited by something else than the rain which follows an electrical discharge. The Swedish Professor Lemstrom, noting the extraordinary growth of barley in high latitudes, associated it with the electrical discharges of the Far North, and experimented by means of the application of high tension electricity from a network of wires. As he was able to use only an uncertain influence or friction electrical machine, and his network was close to his crops, his method was not commercially practicable. The question of the electrification of crops made a considerable advance, however, when Mr. J. E. Newman, a young electrical engineer, at Gloucester, who had closely followed Lemstrom's work, and carried on experiments in a market garden at Bitton, raised the network to a height sufficient to allow farm carts to pass below it, and ordinary cultural operations to be carried on, and, in co-operation with Sir Oliver Lodge, used an induction coil connected through Lodge valves.

Since 1906 Mr. Newman's experiments, in association with Sir Oliver and Mr. Lionel Lodge, have been proceeding on the land of Mr. Raymond Bomford, near Evesham, a large farmer, whose father was one of the first agriculturists to use a steam plough. Under the Newman-Lodge system the wire is taken from the dynamo to a shed in one of the fields which are to be electrified. This shed contains apparatus for transforming the electricity to high tension and also the vacuum valves. The network over the crops consists of a kind of grid-iron of wire, supported from each pole with larger insulators than those seen on telegraphic poles. The poles are 70 yards apart in the rows and 100 yards apart between the rows. The thick telegraph wire is extended down the rows with thin wire-to encourage leakage-at every 10 yards. The thin wire is invisible 20 yards off. There is a slight fizz caused by the electrical discharge, and in walking beneath the wires without one's hat a slight sensation may be experienced. At night there is some glow. If a wire breaks—this does not always happen—any one picking it up would receive an unpleasant shock; but though there are obviously possibilities of electrocution in the high-tension shed, there is no risk to life in the field. An installation on the simplest type for experimenting on from five to ten acres, a dynamo being available, would probably cost about £100. In the same conditions an installation for 60 acres might cost about £225. A complete outfit for 30 acres, including engine dynamo, and shed, would involve an expenditure of something like £300, but an installation for twice the area would not cost more than another £100. There is a probability of the expense being decreased in the future.

The figures available as to wheat at Evesham, grown on different fields—for the apparatus can be readily moved—are as follows :—

1906.	Increase,	39% Red Fife; 29% White Queen.	
1907.	,,	29% ,, ,,	(electrified, 41·4 bushels per acre; non-electrified, 32 bushels).
1908.	,,	14·3% Square Head	(electrified, 7·68 acres, 32·5 bushels per acre; non-electrified, 10·2 acres, 26·15 bushels).
1909.	,,	23% Red Fife.	
1910.	,,	13% Webb's Red Standard	(electrified, 11 acres, 412 bushels per acre; unelectrified, 7·27 acres, 240 bushels. Current weaker than in previous years).

THE PROCESS OF ELECTRIFICATION.

What happens during the process of electrification? The phrase used by Sir Oliver Lodge is "electrical massage." It has been suggested that the effect of sunlight on leaves, that is, the work it does in enabling the leaves with the assistance of chlorophyl to store carbon from the air—is indirect. Its effect may be to produce electric currents which make the sap assimilable. Electricity may do directly what the sun is doing indirectly. In other words, the electrical discharges may supplement sunshine. It is regarded by experimenters as certain that electrification is injurious in continuous sunshine and in dry weather, and that it is in dull weather that it has the greatest effect. The electricity employed is positive; plants give off negative electricity; and Sir Oliver Lodge's idea is that plants by electrification are able to give off more negative electricity. Obviously, massage cannot be substituted for food, but electrification may have a toning effect.—*Times.*

The Use of Manure.

Dr. G. Campbell Arnott, Technical Adviser of the Fertiliser Manufacturer Association of London, has been writing for the *Journal of the Jamaica Agricultural Society* a series of articles on the use of Fertilisers. In one paper he observes:—

"Though it is many years since Chemical or Artificial Manures, now popularly known as 'Fertilisers,' first came into use, there are still many who are prejudiced against them, and are of opinion that they are vastly inferior to natural manures such as cattle or pen manure.

"That this erroneous opinion still obtains, is due usually to either a want of proper knowledge as to the effects of manures or to having used unsuitable or inferior fertilisers at one time or another. A better understanding of the action of fertilisers will enable them to be used with profit and economy in making the best use of the dormant reserve stores of plant food present in the soil.

"It is to be borne in mind that fertilisers are not *rivals* of natural manures but *aids* or *supplements* to them.

"Natural manure (cattle or pen manure) is the most excellent and worthy of far more care and attention than is given to protecting it from the rain and sun. Its great value consists in its improvement of the tilth or texture of soils and in promoting their power of holding water which enables the crops better to withstand drought. As a fertiliser, cattle or pen manure is a complete manure, containing nitrogen, phosphates and potash, though it is not a well balanced one because it is invariably poorer in phosphate than in either nitrogen or potash owing to the animals acquiring and retaining most of the phosphate contained in their food for building up their bone, muscle, etc. It is a lasting manure because the plant foods are largely slowly available, in fact hardly all recoverable or made use of during a lifetime. On the other hand the effect of fertilisers on vegetation are comparatively rapid and take place soon after their application, from which it will be recognised that both natural and artifical manures have separate and distinct places in agriculture and are most effective when used in combination.

"Natural manures should always from the *basis* of successful practice but heavy applications alone are not economical. In the vast number of trials which have been conducted for many years in the United Kingdom and elsewhere on all kinds of crops, heavy dressings of dung alone never have yielded crops of such large quantity, good quality or as profitable as when a much smaller quantity (one half even) has been used supplemented

with suitable fertilisers. Fertilisers being concentrated plant food and of very much less bulk are cheaper to handle and can therefore be more conveniently taken to distant and hilly portions of the estate, which from their inconvenient position seldom if ever receive any manure.

"The advantages of the foregoing method of manuring or feeding the crops will be readily recognised, because the plants are able to assimilate the more quickly available plant food contained in the fertiliser from the commencement of growth until the plant food in the natural manure becomes available, so that all through the period of growth the plant receives a continuous supply of food.

"The indispensable plant foods always more or less deficient in long cultivated soils in available form are phosphoric acid (which is the active principle in phosphates) nitrogen, potash and sometimes lime. These must *all* be present in sufficient quantities for *all* crops. Should one or more be deficient, the size of the crop is limited by the essential element of plant food present in the *least* abundance. No excess in the supply of any of the other plant foods can possible compensate for this deficiency. No excess of nitrogen can replace a shortage of phosphates and *vice versâ*."

There is a good deal to be learnt from a careful study of the above remarks, though perhaps the first inclination of the South Indian planter, when he reads them, will be to sigh because they indicate a policy of perfection that is hopelessly unattainable by him. Planters in this part of the world can rarely, if ever, hope to have enough animal manure to add to their lands. This, however, makes the raising of leguminous crops all the more necessary. Their efficacy has been abundantly proved in various countries and with regard to many agricultural staples.

Practical experiments, carefully observed, no doubt offer the best means of finding out what is most useful for particular conditions; but time is often saved if the planter has some idea of the chemical structure of the soil he wishes to cultivate and of the fertilisers he thinks of applying; as well as of the general requirements of the plants that engage his attention.

Dr. Arnott remarks further:—"*Nitrogen* is the element which stimulates growth, it promotes the formation of both leaves and stems. If in excess, that is, when not balanced by sufficient phosphate and potash, a longer growth is induced by which maturity and ripening are retarded, and moreover the crops are rendered more liable to fungoid diseases of all kinds.

"Nitrogen is contained in a readily soluble form in all nitrates, as for example the nitrates of Soda, Potash and Lime. It is also obtained in the form of Ammonia, as Sulphate of Ammonia, and as Organic Nitrogen in bones, dried blood, meat, meal, guano, cotton seed and other seed meals, etc. All the nitrates are very soluble in water, therefore readily washed out of the soil, so should never be used unless the plants have well developed roots by which they can assimilate the nitrogen almost at once and thereby avert loss of this expensive constituent. Sulphate of Ammonia is less soluble and not so prone to loss by drainage, though it acts very quickly on plant growth. The best forms of organic nitrogen are much less liable to loss from these causes, because they are more slowly soluble and available. All forms of leather as a source of organic nitrogen should be avoided, because they are inert and valueles in the soil though shown in a laboratory analysis.

"*Phosphates* (the active principle of which as already stated is phosphoric acid) have a very different action to that of nitrogen, an excess of which as before mentioned delays the maturing of crops. Phosphates not only produce healthy growth, hasten maturity and ripening, but have an important effect on the early development, and root growth of all plants. Phosphates are obtainable in several forms, in the raw state, which is insoluble in water such as mineral phosphate, bones, etc., in an intermediate form which though insoluble in water, is absorbed by the root of the plants, and is known as "reverted" or available phosphate because it is soluble in a solution of Citric Acid. The best form, however, is that known as Soluble Phosphate, from the fact that it is soluble in water. When applied to the land, the first rainfall, a heavy dew, or even the natural moisture in the soil causes it to dissolve and sink into the earth, where it is arrested in a finely divided condition, and disseminated throughout the soil at the roots of the plants. It is in a far finer state of division than it could ever be possible to grind it by mechanical means.

"Phosphates in whatever form they are supplied, whether soluble in water or otherwise, do not leach or wash away in the drainage water like nitrates but are retained in the soil, almost in the surface soil, *i.e.*, in the top nine inches, and in such a form as can be readily assimilated by the plant roots. Thus even when applied in excess, phosphate is never wasted.

"*Potash* has a marked effect on the production of starch and sugar. It is usually present in sufficient quantity for most crops in clay and heavy soils and, though most probably owing to long cropping it is in a dormant condition, it can largely be rendered available by applications to the soil of lime or chalk (carbonate of lime). Potash is usually deficient in light soils and therefore an application of potash will almost invariably be found profitable on such soils.

"Potash is used in agriculture as sulphate or chloride, the latter being better known as muriate of potash. It is to be preferred as sulphate, though somewhat the most expensive.

In the extract (taken from another source) that follows there is very little, if anything, that will strike the planter as containing information of which he was not possessed previously; but the brief recapitulation given of points that ought certainly to be borne in mind appears to deserve a place in these "records" that *The Planters' Chronicle* places at the disposal of its readers :—

"The different elements of plant food are required in different proportions by different plants. Soils vary in their supply. It is, therefore, well for the farmer to know what his plants need and what his soil contains before he invests in fertilisers. There is only one practical way for him to do this, and that is to observe closely the growth of crops on his own land and by plot experiments. If the plants grow rapidly and make an abundance of leaf and stalks, it is evident the land has plenty of nitrogen. Then, if there is not a proportionate amount of fruit, it is safe to assume that the soil needs phosphoric acid. Then again, if the plant has not a good colour, or if it shows a tendency to drop its fruit before it is ripe, the indications are that the soil needs potash. While most soils are deficient in all these elements of plant food, the farmer who can get large quantities of manure, made from well bred animals or who grows such legumes as are adapted to his latitude will very largely eliminate the expenses of nitrogen from his fertiliser bill. In fact it is our belief that it may be practically all avoided."

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The Scientific Officer.

Mr. R. D. Anstead, B.A., returned on Tuesday, the 16th instant, from his tour in Cochin and South Travancore, having proceeded *en route* to Ootacamund, where he discussed with two members of the Government certain points in connection with the proposed establishment of an Experiment Garden for Coffee hybridisation purposes. Whether Government will grant the necessary plot of land or not, has yet to be decided.

Mr. Anstead leaves Bangalore on Monday, the 22nd instant, for a tour in the North Mysore district. A programme of about a fortnight's work has been arranged there.

The U. P. A. S. I. Exhibition.

Planters are reminded of the executive's desire to have a rather more imposing display this year of coffee, tea, rubber, cardamoms, &c. It would materially help towards the assurance of a successful little Exhibition if early intimation were given to the Secretary, U. P. A. S. I., regarding exhibits that may be expected. Exhibitors are requested also to kindly intimate their willingness to allow their samples to be passed on subsequently to the Mysore Dasara Industrial and Agricultural Exhibition and the Mysore Government Museum.

An Old Record of Green Manuring.

In an interesting paper, entitled "Old Time Indians," by Dr. W. E. Roth in *Timehri*, is quoted a quaint passage from one of the old Jesuit Fathers engaged in missionary work among the aborigines of the Guianas, containing a distinct reference to green manuring. Its value was evidently recognised by the untutored husbandmen of those days, and its practice was incorporated in their primitive agricultural operations. The passage reads:—"With their axes made of a double-edged flint fixed midway in a suitable wooden handle, they used to cut the green stems of the brambles and briars after having broken them down with hard wood clubs; the women subsequently burnt the dry timbers. It took them two months to cut down a tree. . . . . To start, throw up, and form furrows after burning the undergrowth, they make use of shovels formed of very hard wood. . . . . They manufacture these shovels with fire, burning some portions, and leaving others free, not without skill, symmetry, and the expenditure of much time. . . . . . *They heap up the earth on either side of the furrow, and with it cover the straw and dried grass*: they then sow their maize, yams, and other roots, etc., and in all parts a large quantity of capsicums."

Scientific Officer's Papers.

No. LXIV.—REPORT ON A TOUR IN COCHIN AND SOUTH TRAVANCORE.

I left Bangalore on 12 April, and at the special request of the Malabar Coast Planters' Association, paid a visit to Palapilly and the neighbouring estates to investigate what was thought might be an attack of 'die back' on the trees.

During the dry weather, which has this year been exceptionally severe and lasted over a much longer period than usual, it is not uncommon for some of the young shoots and the terminal branches of the trees to die back for a certain distance. On examination this appears to be due purely to climatic causes, and these dead branches have none of the appearance characteristic of the fungi causing the disease known as "die back," *viz. Gloeosporium* and *Botryodiplodia*. This disease was described in detail in a former report which appeared in the *Planters' Chronicle* (Vol. V, p. 176). In this case the shoots appear to die back from the tips, and not from the middle of their length as in the case of attack by the fungus, and it is probably due to wind and lack of moisture. The occurrence of these dead branches is much more common where the soil is shallow and there is an outcrop of rock. When the rains come the tree continues its growth from below the dead portion. In the case of attack by the fungus the attack would continue down the shoot and kill whorl after whorl of branches till the tree was killed outright. In this case nothing of the sort happens, and isolated branches die and not whole whorls of them.

All dead shoots should be removed if possible for sanitary reasons, since fungus spores find a suitable place to grow on dead wood.

While I was in the district the trees were being painted with Bordeaux Mixture as a preventative against Pink Disease. After the signal success of the experiments with this method last year, reported in full in the *Planters' Chronicle.* (Vol. V, p. 210, Vol. VI, p. 98), it should be adopted in every district where this disease occurs. The cost is very small, averaging about a rupee per acre, and if it is borne in mind that the loss of a single three year old tree represents at least a sum of five rupees it will be seen that it is a profitable line of insurance against loss.

I left the district on 17 April and proceeded to Cochin on my way to South Travancore, and here I took the opportunity of calling upon Messrs. Peirce, Leslie & Co., Ltd., and discussing with them the experiments they have been making, and are going to repeat this year, with the crushing of Hevea seed.

In connection with this subject I noticed that attention was called in the Correspondence columns of one of the papers lately to the fact that the output of seed was small, and thus the yield of oil would be limited, while the value of the cake as a cattle food was also small and so the industry was not likely to prove a profitable one. This is of course the case to a certain extent, but from the planters' point of view it is slightly different. The cake should be used as a fertiliser and thus the estate manure bill reduced, and as I suggested at the Annual Meeting in 1910, the most economical way of dealing with the seed would be through central factories. That there is likely to be a market for the oil is shown by Prof. Dunstan's letter to the Ceylon Planters' Association, which was published in the *Planters' Chronicle* (Vol. VI, p. 170). The residual poonac promises to be a good and valuable fertiliser as shown by the analyses lately made (Sc. O. Paper No. lviii, *P. C.*, Vol. VI, p. 122).

Leaving Cochin on 19 April I proceeded to South Travancore and spent a week in the Kalthurity Valley, and then visited the estates on the hills above Kallaar, finally attending a meeting of the South Travancore Planters'

Association at Quilon on 6th May, where I delivered an address which has already been published. (*P. C.*, Vol. VI, p. 269.)

The manuring which has been done with Rubber in this district has undoubtedly had a good effect, and it shows up in the increased rapidity of growth of the trees and the dark green, healthy appearance of the foliage.

Much of the Rubber is now being tapped, and I called attention in my lecture at Quilon to several points in connection with this. I quote below what Dr. Cramer, the Director of Agriculture, Suriname, has to say in his book, 'the Culture of Hevea in the Malay Peninsula,' under the heading of "points which should be taken into consideration during tapping:"

"1. The layer of bark which is to be shaved off should be as thin as possible.

"The importance of making this shaving as thin as possible has already been pointed out; the thinner the strip which is taken off, the longer the tapper can make a given tapping area last out. A good method of keeping this well in the mind of the native workman is to draw a guide line, one or two inches below the first tapping line. He knows then that he has to so arrange his work that he may reach that line within a given number of days, and he will do his best to approach the line as slowly as possible.

2. "The cuts must be made exactly parallel to the first side cut.

"As we have already seen, the whole bark surface, within a given area, must be worked off. If the direction of the tapping line is slightly changed, by the time the greater part of the surface to be tapped has been worked off, there will remain a triangular patch of bark. This means in the first place, a loss of the latex remaining in this patch, moreover, the presence of these patches interferes with the clean renewal of bark."

Here again if extra guide lines parallel to the tapping lines are put in, they will aid the tapper to keep his cuts parallel. I should advise planters, especially those who are only just beginning to tap and who have to train up their tappers in the way they should go, to put in such guide lines an inch apart between each pair of cuts. Thus if the original tapping lines are marked out eight inches apart there will be seven of such guide lines between each pair of them. Dr. Cramer continues :—

"The side cuts must terminate at the proper margin, not exceed them, not fall too short.

"A mistake which is often made on estates beginning to tap is that the cuts are made longer and longer, so that they exceed the marginal lines and consequently encroach on the area that should belong to a subsequent year's tapping. The renewed bark will accordingly have to be re-tapped before a four years' interval has elapsed. And again, the growth will become irregular, a fault of some importance here, as the marginal lines of tapping surface first under operation, have to be used as the conductive canals of the next year's operations. If, on the other hand, the cuts are made too short, the consequences will be as already enumerated under head 2."

Another point which should receive attention is the yield of latex in comparison with the amount of bark used up. In the dry season there comes a time when the amount of latex obtained is very small compared with the area of bark removed, and tapping should stop when this proportion becomes an unprofitable one.

As in other districts, Stump Rot in the Tea is a troublesome pest and closely follows the destruction of *Grevillea* trees. I would again strongly urge planters when it is necessary to remove a *Grevillea* or *Albizzia* tree from the Tea to remove the stump also at all costs.

I left Quilon on 8 May and proceeded to Ootacamund to meet the Secretary to Government, and discuss with him the proposed experiment plot in the Nilgiris for studying the hybridisation of coffee, an account of which

will be found in the *Planters' Chronicle*, (Vol. VI, p. 46). I am glad to be able to report that the negotiations are proceeding in a satisfactory manner, and I confidently hope that shortly the land will be granted to us and that work will be commenced under the supervision of the Government and myself.

While on the subject of hybridisation I will take the opportunity of quoting from the 'Report on the Progress of Agriculture in India for 1909-1910,' compiled by the Officiating Inspector-General of Agriculture in India, showing what valuable results have been accomplished by means of hybridisation and selection in the case of Wheat and Cotton in India.

"By the introduction of a better plant it is easily possible to increase yield and improve quality without adding to the cost of cultivation."

"The improvement by selection and hybridisation which has been done on wheat deserves special mention. It has been proved that India can grow not only stronger wheats with better milling qualities than those now exported, but there are many wheats which it has been found possible to class with American and Canadian wheats which command the highest prices in the English market. Some new hybrids have also been raised which from point of quality and yield promise to equal if not surpass those already in existence. These wheats have been subjected to tests which include the grinding of the wheat into flour and the baking from it of bread. Experts both in India and England are unanimous in their opinions that they are far finer than anything which is now being exported and millers at home have declared their eagerness to purchase them. These facts should sooner or later have a profound effect on the export trade."

"Experiments in Cotton Hybridisation have been continued on several farms. At Surat (Bombay) plant to plant selection has been continued in the case of more promising crosses. The best cotton hybrids continue to give a lint valued considerably in excess of the local variety, and in some notable instances have obtained a higher relative value than ever before. The Bombay Department has been distributing seed of the best hybrid cottons among cultivators near the Surat farm. About 280 acres were sown the first year which has now increased to over 3,000 acres. The value obtained by the cultivators without the aid of an auction was 5 per cent. more than that for Surat cotton. The yield was also considerably higher than that of the ordinary crop. Another advantage noticed by cultivators was the uniformity with which the bolls opened. This reduces the charges for picking and watching and the cultivator's appreciation of this fact is shown by a keen demand for the seed. Arrangements have been made for the separate ginning of this seed cotton with a view to obtain the pure seed for distribution. Some crosses made between different kinds of Upland at Gadag are yielding hopeful results. At Nadiad some crosses have been evolved between Texas and Bourbon and also between Egyptian, Sea Island and Bourbon. The purpose of crossing was to remove the objection to Bourbon that its bolls open badly, causing weakness in the fibre. The crosses made have proved superior in this respect. Perhaps the most important work in the hybridisation of cotton is being carried out in the United Provinces by Mr. H. M. Leake, the Economic Botanist. Several crosses have been recently made which give promise of being a great improvement on present local varieties."

I left the Nilgiris on 14th May and returned to Bangalore on the morning of the 16th, calling on my way at Coimbatore, where I paid a brief visit to the Agricultural College and Research Institute, and inspected Messrs. T. Stanes & Co.'s Manure Works,

I desire to express my thanks to the Hon. Secretary of the South Travancore Planters' Association and all those who so kindly aided me and offered me their hospitality during my tour.

RUDOLPH D. ANSTEAD, *Planting Expert.*

DISTRICT PLANTERS' ASSOCIATION.

Malabar Coast Planters' Association.

Proceedings of the Annual General Meeting held at the Trichur Club on May 6th, 1911.

PRESENT.—Messrs. E. F. Barber, (Chairman), W. D. Tait, A. H. Mead, T. Harding Pascoe, R. De Roos Norman, R. C. De Roos Norman, E. F. M. Norman, H. C. Plowden, W. E. Forbes, and R. L. Gudgeon, Honorary Secretary.

Honorary Member.—Mr. W. M. Browne.

The Chairman on rising expressed regret at having to inform the members of the sudden death of the Chairman of the United Planters' Association, Southern India, Mr. R. D. Tipping, and a unanimous expression of sincere regret was expressed for Mrs. Tipping and Mr. P. G. Tipping.

The Proceedings of the last Meeting.—Read and confirmed.

The Chairman remarked as follows :—

The Association started in April 1910 with 2,500 acres. This area was increased to over 8,000 acres by the 1st of January 1911, and it is estimated that 3,000 acres will be opened this year, which will bring our total acreage up to 11,000 acres. Owing to the want of funds for current expenditure it was proposed at the last meeting to raise the subscription to 1 anna 6 pies per acre.

The Rubber Theft Act has made little progress ; but the Cochin Durbar has promised to support the Travancore Durbar in any action it may deem fit to take.

As regards the Scientific Officer the present idea is to have a Scientific Officer among ourselves under a local committee to work in conjunction with Mr. Anstead.

We have paid up to date Rs.3,540-0-11 to the International Rubber Exhibition Fund. Up to the end of last year, with the exception of the Shevaroy Planters' Association, we were the only Association who had paid in any money to this Fund. At the present moment we head the list of subscribers, and every estate has paid at the rate of 4 annas per acre. I think we can congratulate ourselves that if we had not taken such a prominent part in this matter it is very doubtful if Southern India Rubber estates would have exhibited at the International Rubber Exhibition.

It has been suggested that the Nelliampathy Planters join this Association if they wish. Personally, I see no reason why they should not join, as they have a great deal in common with the Cochin Rubber Planters.

In making remarks on the roads of Cochin State which I considered worse than any other roads in neighbouring districts I know—I had the pleasure of meeting the Dewan of Cochin on the Nilgiri Ghât Road, whose motor-car was temporarily stranded owing to a stone getting into the fly-wheel, and the Dewan expressed the opinion "that he could not understand why the people did not agitate for better roads." I feel that if the Dewan thought people ought to agitate for better roads on the Nilgiri Ghât Road there would be no harm in the Association agitating for better roads in Cochin.

THE HONORARY SECRETARY'S REPORT.

Gentlemen,—I much regret that accounts have not been properly audited. Mr. Norman was asked by the Committee to audit the accounts, and he very kindly accepted ; but owing to his being away and also my being away,

I was only able to hand over the books to him yesterday. I have received a letter from him to-day, which I read—"I return the books, papers, &c., by bearer belonging to the Malabar Coast Planters' Association, and regret that I cannot audit the same, as the time given is too short. I have, however, glanced through the same, and as far as I can tell the books have been correctly entered up and written up to date."

Since April 30th I have paid the United Planters' Association, Southern India, all the money I have in the Bank, namely, Rs.297-1-9, but we still owe the U. P. A. S. I. Rs.54-11-1, as our total at 8 pies per acre on 8443·17 acres comes to Rs.351-12-10.

Books, Stationery, etc., seems very high but with stock of books, etc., we have in hand this amount should not be necessary another year.

Travelling Expenses:—This item is for the Delegate's expenses Rs.100 at the U. P. A. S. I. meeting as well as writer's expenses coming into Trichur at General Meetings.

I have received Rs.72-8-0 since closing the year's accounts for last year's Estate subscription, Rs.50 which has been paid to Messrs. Wiele and Klein and is recoverable, Rs.132 which the Association has paid the Post Office as guarantee for Palapilly Post Office, should I think be paid by the Estates interested, and private members are due Rs.40. These amounts, less Rs.2 due to Mr. Horsfall and Rs.54-11-1 due to the U. P. A. S. I., would give us a credit balance of Rs.237-12-11, but it must be remembered that these accounts are for 14 months, the estates joining first having paid 2 years' subscriptions.

Accounts.—Resolved that the sum of Rs.132 appearing on the accounts under the head of Post Office should be written back and that this sum should be recovered from the Estates concerned. Proposed by Mr. T. Harding Pascoe and seconded by Mr. A. H. Mead.

Resolved: That the accounts be taken subject to audit. Proposed by Mr. R. De Roos Norman and seconded by Mr. W. D. Tait.

To raise the subscription from 1 to 1½ annas:—Resolved: That the annual acreage subscription to the Malabar Coast Planters' Association be increased to 1½ annas per acre to cover general Association expenses. Proposed by Mr. A. H. Mead and seconded by Mr. H. C. Plowden.

Scientific Officer's Assistant.—Read Mr. Murphy's letter. Resolved: That an Assistant for the District is desirable and that a Committee be appointed to go into the matter. Proposed by Mr. A. H. Mead and seconded by Mr. R. De Roos Norman.

Resolved: That Messrs. A. H. Mead, H. C. Plowden, R. De Ross Norman, E. Lord and Campbell Hunt form the Committee. Proposed by Mr. E. F. Barber and seconded by Mr. R. L. Gudgeon.

Increase of Writer's Pay.—Resolved: To allow the Honorary Secretary to engage writer up to Rs.25. Proposed by Mr. R. L. Gudgeon and seconded by Mr. W. E. Forbes.

Labour.—Read correspondence between the Honorary Secretary of the Anamalai Planters' Association and Honorary Secretary, Malabar Coast Planters' Association, regarding labour rates.

Sub-Committee for different Estates.—Resolved: That the Honorary Secretary write to the Collector of Malabar requesting that a member of this Association may have a seat on the Malabar District Board. Proposed by Mr. E. F. Barber and seconded by Mr. H. C. Plowden.

Roads.—Resolved : That the Honorary Secretary do write to the Dewan through the Chief Engineer of the Cochin State on the subject of roads which are in a very bad state of repair to the different Rubber Estates in the District, namely, the road from Pudukad station to Palapilly Rubber District, 11 miles, and from Trichur Station to Vellanikara Estate, 6 miles, and praying that the same may be put into good order. Proposed by Mr. R. De Roos Norman and seconded by Mr. W. E. Forbes.

Palapilly Hospital.—Resolved : "That this meeting approves of the Honorary Secretary's letter of the 7th March 1911 to the Dewan of Cochin and considers that it is desirable that the status of Palapilly Dispensary should be raised and accommodation for in-patients be provided. Proposed by Mr. A. H. Mead and seconded by Mr. H. C. Plowden.

To Allow the Nelliampathy Planters to Join this Association.—Resolved : That this Association will welcome any Nelliampathy Planter who wishes to join the Malabar Coast Planters' Association. Proposed by Mr. R. L. Gudgeon and seconded by Mr. H. C. Plowden.

The following gentlemen were appointed as the Committee :—

Chairman	...	Mr. A. H. Mead.
Honorary Secretary	...	Mr. R. De Roos Norman.
	...	Mr. H. C. Plowden.
	...	Mr. E. Lord, and
	...	Mr. Campbell Hunt.

Messrs. H. C. Plowden and Campbell Hunt were unamimously voted delegates to the United Planters' Association of Southern India to represent this Association.

Resolved : That a vote of thanks be conveyed to the Honorary Secretary and Committee of the Trichur Club for their courtesy in allowing the Association to hold their meeting in the Club.

With a vote of thanks to Mr. Barber and Mr. Gudgeon the meeting then closed.

(Signed) E. F. BARBER,
Chairman,

(„) R. L. GUDGEON,
Hon. Secretary.

South Travancore Planters' Association.

1. At a Special Meeting held on the 6th May 1911 at the Quilon Club the following members were present :—Mr. J. G. Knight in the Chair, Mr. D. G, Cameron, Mr. L. M. Young, Mr. R. D. Anstead, Scientific Officer, and Mr. A. W. Leslie (Honorary Secretary). Visitors : Mr. T. H. Cameron and Mr. W. Clare.

The Minutes of the last Meeting were taken as read.

2. The Chairman, before further proceedings, read the Circular received from the Secretary, U.P.A.S.I., intimating the death of Mr. R. D. Tipping, and it was resolved that this Association do put on record the feeling of heartfelt sympathy at the sad and sudden loss of so able a Chairman.

3. *North Mysore Resolution.*—Read correspondence from Honorary Secretary and then resolved to forward copy of same to the person implicated and ask for his views of the question.

Further resolved: "That this Association note with regret that the North Mysore Association did not see fit to ask for an explanation before allowing a libellous statement, affecting all members of this Association, to be published in their Minutes, and that a copy of this resolution be sent to the North Mysore Association."

4. *Mr. Martin's Labour Map.*—Laid on table, and Honorary Secretary was instructed to fill in and send the particulars and details asked for.

5. *Testimonial to Mr. Wickham.*—Read Circular No. 23/11 from U.P.A.S.I. and it was resolved: That the Hon. Secretary be instructed to ascertain what other Associations intend doing in the matter.

6. *Assistant Scientific Officers Scheme.*—Resolved: "That the Hon. Secretary be instructed to ask the Secretary of the U.P.A.S.I. for details of this Scheme and when these are obtained that copies should be sent to the Directors of the different Companies saying that this Scheme will come up for discussion at the next Annual Meeting of the U.P.A.S.I."

7. Mr. Cameron.—Gentlemen, We are all very pleased to see Mr. Anstead with us again and shall be glad to have his lecture this morning.

Mr. Anstead then addressed the meeting. His lecture has been published already as Scientific Officer's Paper lxiii (*P. C.*, Vol. VI, No. 10, pp. 269-271).

Mr. Cameron.—Gentlemen, I beg to propose a very hearty vote of thanks to Mr. Anstead for his very interesting and instructive lecture (Hear, Hear).

With a vote of thanks to the Chair the meeting terminated.

(Signed) A. W. LESLIE, *Hon. Secretary.*

Per Capita Use of Coffee.

The United States is using about 11 pounds of Coffee per capita. The Coffee habit is one that clings, and we doubt if consumption varies as much as indicated by the United States Government Report, which bases the consumption on net imports, which vary greatly from year to year. For that reason annual average for a period of five years is a better guide. The following compilation shows what is probably near the actual use of the article :—

			Bags.
Stocks in United States, July 1, 1906		...	3,675,986
Arrivals,	1906-07	...	7,286,681
,,	1907-08	...	6,555,829
,,	1908-09	...	7,822,727
,,	1909-10	...	6,373,932
Four years' supply ...		...	31,715,155
Less stocks, July 1, 1910		...	3,021,781
Net supply, July 1, 1910		...	28,693,374

Reckoning 132 pounds to the bag, this gives a total of 3,787,525,368 pounds, or an annual average of 946,881,342 pounds to meet the requirements of an annual average population of 86,000,000. This shows a per capita use of 11·1 pounds of Coffee against a Government average for the same time of 10·8 pounds, a difference of only 0·3 pounds. It is safe to conclude the United States uses fully 11 pounds of coffee per capita.—*Retail Grocers' Advocate.*

SOILS AND FERTILISERS.

The Three Brothers.

A tale from the Arabian Nights which may still be experienced at the present day.

NHAPPY STRANGER!

"Dost thou come here to increase our misery, and to perish thyself?" Such were the words used by the hungry and poor looking guardian of the gate of the mighty city of the Kalif, to the traveller who, on his sturdy palfrey, craved permission to enter the city. In great amazement the traveller asked what was amiss and received the answer, "Thou evidently hast come here from afar, oh stranger, that thou knowest not of the great misfortune that has befallen our all-powerful Kalif and his city. Although the God of Mohammed makes the sun to shine on us as he used to do, and although the good spirits of heaven send us rain when we are in need of it, yet grow our grain and our millet no more as in former years. Every year the devastating famine comes anew, bringing our children into dreadful misery and leaving our best warriors powerless and defenceless against our enemies." "And have ye then tried no remedy for this pestilence?" asked the stranger. "By the beards of the Prophets, Yea! For years already has our land been cursed, and the Ruler of the Faithful, Allah bless him, proclaimed that he who succeeded in banishing these evil spirits from the land would receive in marriage the hand of his daughter. But all means which have been tried have been of no avail, and we must face further famine."

The stranger listened with great eagerness to the words of the guardian of the gate and entreated him to tell him further and with more detail all that had taken place.

He heard that at first the priests and the wise men assembled had tried to dispel the ban by prayers and charms. All these proved of no avail, and the Kalif and his people were in veritable despair. At last there came two strangers from the Land of the Setting Sun, each carrying with him a most mysterious sack. They wished to be brought into the presence of the Kalif, and each declared that by means of the contents of his inexhaustible sack, the misery could be stayed, and the land be made as rich and happy as in former days.

"What did they call themselves, and what success had they?" cried the new comer in great excitement. "Should'st thou know these two strangers, then thou hast reason for deepest compassion. One called himself Phosphate, and the other, who also had a name strange to our ears, was called Nitrogen. Both of them now languish in prison, because they could not fulfil their promise with deeds. The one Nitrogen declared that he could make the corn grow so luxuriantly, as no one in the land had previously seen; the other said 'What use is it to you that the corn grows high, if the ears be empty?' and promised to produce grains of corn as large as hazelnuts. The Kalif, in his wisdom, entrusted to each a province in which he should prove the magical virtues of his sack. In truth, after a year Nitrogen produced stalks higher than a man, and the grains of corn which Phosphate produced were as large as hazelnuts. Alas, in the second year, the corn and straw were again small, and in the third year the old misery, famine and pestilence returned.

"Then the Kalif was wroth and had them both thrown into prison, where they led a miserable existence in the company of snakes and poisonous vermin."

"Oh lead me to the Kalif," cried the stranger. "Unfortunate creature, wilt thou rush headlong to ruin? What would'st thou do?" But the stranger heeded not the warning; he was brought before the throne of the Kalif, and bending low said, "Ruler of the Faithful, I have heard of the misery that prevails in thy land, and I wish to help thee." But the Kalif said "Hast thou also heard of these men, who came from the Land of the Setting Sun, and who now languish within the walls of my prison? They came here with as crazy notions as thou; would'st thou share their fate?" "As Allah ordains!" answered the stranger. "Set both of these men free, and I will, with their help, thy land deliver. These men are no impostors, as thou hast naturally supposed, but they lack prudence. Their selfishness has led them into this misfortune. Should it please your Highness I will relate to thee their story, which is the same as my own. There lived once in the distant Land of the Setting Sun a merchant to whom a kind fairy had presented a talisman which consisted of three magical sacks whose contents are inexhaustible. He had only to strew a little from each of these three sacks on the land and even the driest sand bore fruit an hundredfold. As the merchant was at the point of death, he summoned before him his three sons, whom he had named in honour of the fairy after the three spirits which dwelt in the three sacks. Handing over to them the talisman, he said, 'I bequeath to three jointly these three sacks. Ye will procure for yourselves riches and honour, if ye hold fast together and never part from one another. The spirit of this sack called *Nitrogen* makes the plants grow quickly; the spirit of the second sack *Phosphate* makes the grains large and the ears full; the spirit of the third, *Potash*, gives the plants health and vigour, it makes the corn nutritious and gives the fruit its good flavour. None of these qualities can the plants, which we mortals must cultivate for our daily bread, lack. Woe be the day, when ye quarrel and strive over possession of the sacks and drift apart! Only if the three spirits work in unison, can the blessing of the good fairy, who gave me these three sacks, be obtained. Think over this well!' After the merchant had said this, his soul departed. But the sons quarrelled with one another and obeyed not their father's word, so that they went and divided up their inheritance, each receiving a sack. The eldest brother received that which obeyed the spirit Nitrogen, the second that which gave the full ears of corn, and the third the sack in which the spirit of Potash dwelt. That youngest brother am I, O Kalif! Both my brothers then went

into the country places amongst the farmers and promised them rich harvests by means of their magical sacks, if they gave them large sums of gold. The farmers believed them and paid them well. But when I came and told them that the magical power of Potash was needed to give the grain vigour and health, they sent me away, for they had no more money. But the magical power of the talisman only works when Nitrogen, Phosphate and Potash work in unison, and my sack with the spirit of Potash they had not. So the people got no return for the money they had spent ; and when my brothers returned again the next year they were driven away with insults and abuse. Now they have also come to thee, oh, Follower of the Prophets, and may Allah send his blessings on thee! How much less could each brother working alone serve thee, seeing that the magic of the talisman only fulfils its purpose if the three sacks are taken together. But if thou be generous and grant them their freedom so that we can all set to work together, then wilt thou and thy land be prosperous for all time." Then spoke the Kalif," If thou hast spoken truly, stranger, thou shalt wed my daughter, but if thou hast lied, then thou must die.' Then he sent his Vizier with the stranger to the prison. And when he saw his brothers, he embraced them and said, " My dear brothers, know ye now that ye have done me a wrong? Why did ye wish to leave me, the youngest, behind? Ye should at any rate have known that without me, Potash, ye could accomplish nothing. I have now come to succour ye. Promise to abide by me with your sacks, and then ye shall be free." And the brothers agreed willingly and said: " We have seen that we did wrong; we will in future go hand in hand together." The brothers then sowed the contents of each sack mixed together upon the fields, which now yielded corn, straw, fruits and grapes in plenty. From this time onward was famine banished from the kingdom. The Kalif was happy once more and wished to give his daughter as wife to the youngest brother, Potash. But the latter said " Ruler of the Faithful, may the God of Mohammed thank thee for thy favour. But we can no longer remain in the land. Allah wills it that Potash, Phosphate and Nitrogen may perform good works in all lands. Call us at seed time and we will see to it that thy corn waxes strong and thy fruit trees flourish." Loaded with gifts, the three brothers took their departure, honoured and esteemed by old and young. And whenever seed time arrives, the Kalif sends his messenger to bring back to his kingdom the three brothers—

Potash, Phosphate and Nitrogen.

Rubber Cultivation in Mexico.

According to a report by the Italian Commercial Attaché in Mexico, published in the *Bollettino di Notizie Commerciale* (Rome) of 13th April, the cultivation of Rubber in Mexico is gradually assuming large proportions in all the States situated in the warm zone, and it is computed that, within five years. Mexico will be a formidable competitor of other rubber growing countries. The rapidly increasing employment of rubber for industrial purposes is causing Mexican farmers to turn their attention to its cultivation.

Nicaragua Coffee Crops of 1909-10 and 1910-11.

The British Acting Consul at Bluefields (Mr. H. O. Chalkley) reports that the yield of Coffee in that country in 1909-10 is given by the Director-General of Statistics as 8,441,323 kilogs. valued at 3,203,231. It is estimated that the yield for the present (1910-11) season will be 20-25 per cent. less.

Kilog.—22.046 lbs.

RUBBER.

Rubber Valorization.

A Brazilian correspondent writes to the *Economist*, under date March 29th :—

The recent heavy decline in the value of rubber has been attributed to foreign speculation, and the native producer and exporter claim that owing to the want of capital they are at the mercy of foreign operators, who manipulate the markets just as they please. The cry has therefore been general that the State and Federal Governments should intervene to put a stop to this state of things. A year or two ago, when the rubber crisis was so severe, the Federal Government came to the assistance of the industry by establishing branch offices of the Banco do Brasil at Manaos and Pará. These have since done very good work by facilitating loans on rubber at long dates and at a reasonable interest. Both of the State Governments concerned (Amazonas and Pará), as well as the Federal Government, are naturally much interested in helping this trade, as it comes next to coffee as an economic factor and is the medium of life for the inhabitants of more than a third part of this country. Advantage is therefore being taken by the Manaos and Pará traders of the present favourable attitude of the Federal and State Gouernments to obtain effective means by which the value of the product may be maintained. The Governor of the State of Pará has been requested to intervene with the Federal Government with a view to obtaining support to the movement initiated by the Manaos and Pará traders in favour of the Valorisation of Rubber. Deputy Justiniano Serpa is the author of a valorisation scheme which has just been received very warmly by the Associacao Commercial of Manaos. This latter body has suggested the idea of establishing general warehouses for valorisation purposes to be worked on similar lines to those erected in Sao Paulo for the valorisation of coffee. Deputy Serpa has further proposed that Amazonas and Pará should jointly found a bank, with a capital of £4,000,000 (6 per cent. interest to be guaranteed), its principal object being the fixing of rubber prices, contributing at the same time to cheapen the means of production and corresponding improvement in quality. According to the latest advices from Manaos, the Governor is in favour of the foregoing propositions, and has promised to confer with the members of the Associacao Commercial in order definitely to adopt the scheme. Yesterday's telegrams from Pará state that the rubber market is in a very critical condition, and several important firms, it was stated, wlll shortly be forced into bankruptcy. Considerable alarm has been felt in business circles, as the Banco do Brasil at Pará was reported to have received telegraphic instructions from Rio to suspend further advances on cocoa and rubber. On the 27th instant, Deputy Passos de Miranda had a long interview with President Hermes and the Finance Minister regarding the means of avoiding the decline in rubber prices at the end of the crop, which is supposed to be forced by buyers who desire to ensure low prices at the beginning of the next harvest. Nothing definite has so far been decided, and it is very problematical if the Federal Government will in any way support or endorse a loan for further valorisation purposes.

The *Times* correspondent at Rio de Janeiro wired on the 18th ultimo :— "The Pará-Amazonas project is vague as yet. The main feature is a scheme to organise a bank with £4,000,000 borrowed capital, the two States guaranteeing the loan and also the interest to the bank on the capital. The bank will make loans against rubber. It is reported from Pará that the Governor will probably call an extra Session of the State Congress for May 8th to consider the matter."

SELECTED CUTTINGS.

Notes on Fertilisers.

Continuing the remarks that were quoted in the last issue of *The Planters' Chronicle*, Dr. G. Campbell Arnott writes in the *Journal of the Jamaica Agricultural Society* :—

"The last link required to complete the chain of indispensable plant foods already indicated is lime, which must be present in soils as carbonate. Though not exactly a fertiliser it occupies a very important place in successful agriculture.

"The use of lime in agriculture, whether as such or as carbonate of lime (chalk, marl, etc.,) dates from a very remote period. In former times it was usual to apply heavy dressings at long intervals but this is found to have rather an injurious effect on the crop for a year or two. Smaller dressings at shorter intervals have proved to be far more beneficial.

"Some of the benefits due to the presence of the Carbonate of Lime are:—

(*a*). It improves the physical character of soil, rendering heavy soils and clays porous, friable and drier, whilst it makes the lighter, sandy and gravelly soils more compact.

(*b*). It corrects sourness and naturalizes acidity in the soil; it promotes healthy growth, fungoid diseases are very rarely found when the soil is well provided with carbonate of lime.

(*c*). It promotes the decomposition of humus or organic matter in the soil and hastens the process of nitrification.

(*d*). It liberates and renders available to the plants potash and other plant food that may be present in soil in a dormant condition.

(*e*). Unless Carbonate of Lime is present in sufficient quantity in a soil it is not possible for chemical fertilisers, the mainstay of profitable cultivation, to exert their full benefit.

"When a soil contains less than one per cent. of carbonate of lime in surface soil, it needs attention and will be greatly benefited by "liming." On heavy clays and damp soils freshly burnt lime should be used, care being taken that this does not contain an appreciable quantity of magnesia, for this often has a harmful effect on vegetation. Apply at the rate of about 15 cwt. per statute acre after having been properly slaked. On lighter soils and loams as well as sandy and gravel soils it is preferable to use chalk or marl (carbonate of lime) because their action is milder than caustic lime, but larger quantities must be used, *viz.*, from 35 to 40 cwt. per acre. These quantities must be repeated every five or six years in preference to larger doses being applied at one time.

"Nearly all unproductive or so called "worn out" soils are deficient in carbonate of lime. The writer has observed whilst analysing and investigating soils both from temperate and tropical climates that when the percentage of lime present falls below that of magnesia it is almost an infallible sign that the soil in question is run down and until the equilibrium is restored by dressings of lime it is hopeless to expect it to produce profitable crops, no matter how much other manures (nitrogen, phosphates, potash) may have been applied.

"On no account, however, is reliance to be placed solely on lime, it must always be backed up by full applications of proper fertilisers. Remember the old adage that

'Lime and Lime without manure
'Will make both farm and farmer poor.'

"Whilst all plants make use of the same kinds of plant food they do so in varying proportions. For instance, a cacao or an orange tree will require different proportions of nitrogen, phosphates and potash to the sugar-cane, or tobacco to the banana. Again, these plant foods can be supplied with the most profit to the grower in differing chemical combinations. Climate, soil, rainfall and other factors have to be taken into consideration in the economical feeding of crops, so that it can readily be understood how money can be wasted in the purchase of unsuitable fertilisers supplying an excess of elements which the crops cannot make use of. This is not perhaps of so much importance in temperate climates where owing to the rotation of crops any surplus of manurial elements from one crop is utilized by the following different crops, but in the tropics where the same crop follows year after year an excess of one or more ingredients from an improperly balanced fertiliser is to say the least a needless extravagance.

"It is very important to remember that the land must be well cultivated and in good condition if the most favourable effects are to be obtained from the application of fertilisers, otherwise it is not only a very wasteful proceeding, but the results are likely to cause dissatisfaction and bring undeserved discredit on scientific manuring.

"In a word manuring cannot take the place of good tillage and cultivation, they must accompany each other.

"Practical experience favours the use of complete manures, that is, those combining phosphate, nitrogen and potash. Incomplete manures which supply only one or two of the elements have been proved by independent experimenters in many countries to be almost invariably unprofitable with perhaps the single exception of old pasture or grazing lands which have accumulated stores of organic matter.

The Stimulation of Agricultural Effort.

Agricultural work, in its broadest sense, means that which is undertaken for the purpose of assisting and directing the development of industries which are concerned with the production from the soil of things useful to man. It includes efforts to introduce and grow new products, and to bring about the best conditions under which they will thrive as well as to maintain a progressive standard of agricultural practice in relation to everything that is grown for use. Such work cannot attain to its best fruition unless means exist for its stimulation and encouragement, and it will be well to consider generally how it originates, and the manner in which the impulses arise that cause its inception, and make for its progress.

The chief ways in which agricultural effort in any given direction is stimulated are through the operation of commercial interests; through the desire by private individuals for investigation and advice; and through suggestions on the part of agricultural departments and similar bodies, arising from their experience and work. There is also the incentive to such effort that comes from the direct action of Governments; but this action is most generally taken as a result of the independent indication of a need, so that Governments may be regarded as being the media through which the stimulus acts. In other words, they often form useful means of directing and encouraging effort that has already been suggested through any of the channels that have just been mentioned.

Commercial methods for the inception and encouragement of agricultural work are becoming employed more frequently than has been the case in the past. The efforts of the late Sir Alfred Jones, in relation to the West Indies and West Africa, from an example of work of the kind that has been undertaken on a large scale. Many other illustrations of the same phase are avail-

able in the West Indies, notably those having relation to the introduction of improved methods of sugar-making, in Antigua and St. Kitts, as well as to the development of the citrus industry and timber resources—the former in Dominica and Montserrat, more especially, and the latter particularly in the first-mentioned island. These do not by any means exhaust the illustrations of such effort, nor do they include the great extent to which the resources of Jamaica, Trinidad and British Guiana are being developed by commercial bodies. They are merely cited as being instances of the large degree to which the exigencies of trade and the supply of raw material are increasing continually the amount of agricultural effort throughout the world. They have a larger interest in the present connexion—an interest which is bound up with the fact that they nearly all illustrate the greater measure in which the necessity is being recognised for obtaining the co-operation of the Scientific adviser, in order that the best results may be achieved. The interests of agricultural commerce demand the existence of the agricultural department, and often require, further, the services of the trained expert immediately employed by those under whose direction the commercial activities are sustained.

The second stimulus to agricultural effort, as has been stated, is concerned with the expressed desire on the part of individuals for the adoption of some definite policy, for the purpose of the improvement of agricultural conditions in a given instance. This desire may arise through the existence of a declining state of a particular industry, through untoward natural or economic circumstances; these may be the prevalence of pests in the first case, or that of unfavourable trading conditions in the second. It may also be caused through the recognition of the need for the development of new industries, either to replace the old, or to provide additional means of agricultural activity, especially for the sake of the diversification of crops. There are instances, too, where this desire for increased agricultural effort has not led only to the attempt to gain the interest of those who are responsible for the administration of the Government or for the provision of agricultural advice; the individuals themselves have decided to attempt a large part of the work, and this is why the present generation is in possession of the results, among others, of the labours of Lawes and Gilbert at Rothamsted, of Coke, of Holkham, and of the Dukes of Bedford.

The stimulation of agricultural effort through the aid of agricultural and botanical departments has its first and greatest illustration in the work of the Royal Botanic Gardens, Kew. Reference is made to this in a recent article (What Science has done for the West Indies: *Nature*, February 9, 1911, p. 477) by Sir W. T. Thistleton-Dyer, from which some of the facts mentioned here are taken. For many years, Kew was almost solely responsible for the work that was done for tropical countries in plant economy, entomology and mycology. It would not be possible to indicate here, even approximately, the extent to which this has been the case. The value of its work in the past, in the identification and distribution of economic plants, cannot be judged adequately; the fact of its being through Kew that the introduction of useful rubber plants into India, Ceylon and the Federated Malay States originally took place, and the circumstance that it was largely on account of its useful advice that the Government of India was able successfully to introduce Cinchona into that country, are sufficient to give some idea of the scope of its work, and of the accurate foresight with which its schemes have been carried out. In the plan of its activities which was sanctioned by Parliament, recognition was made of its duties in relation to commerce and agriculture; in fine, in the words of the article to which reference has been made above, 'The history of Kew . . . . . affords one

of the earliest instances . . . . . of the recognition of the duty of the State to promote scientific knowledge in the public interest.' Among matters that affect more nearly the concerns of the West Indies is the circumstance that it was from Kew that the first suggestion came for the application of the principle of chemical selection for the improvement of the sugar-cane; and, as is stated in the article quoted above, it was this institution that directed the attention of the Colonial office to the importance of the selection of varieties raised from seed, for the same purpose.

Turning from the consideration of detail, the history of the past and present activities of Kew is illustrative of the work that is now being done by a number of agricultural and botanical departments, each placed where it will most usefully serve its purpose.

It has been stated already, that the work of Governments is most usually concerned with the administration of schemes that have been indicated as necessary through other channels. Some of the most extensive work of the kind has been done by the Indian Government, particularly in relation to tea and rubber. In the West Indies, part of the agricultural activity in some of the islands, especially St. Vincent and the Virgin Islands, is directly regulated and fostered by the local Government; and there is, in relation to the former island and Barbados, the circumstance that the Governments were responsible for the appointment of a Commission to investigate the sugar-cane diseases which caused great losses during certain years in the decade 1890-1900. In St. Vincent, too, Government is responsible for the administration of the Land Settlement Scheme, and, as regards the sugar industry more directly, the central factory scheme in Antigua, to take an example, was originally fostered by it. These examples simply serve the purpose of illustration. Others have existed, but are no longer found; for it must be understood that the object of Governmental work in such connexions is most generally the provision of necessary pioneering activity and initial encouragement, further developments being left to individuals and corporations acting under the advice of agricultural departments.

It remains to be pointed out that the consideration of the matters with which this article deals draws attention to the necessity for endeavouring to gain a reasonable mental estimate of the extent and importance of the work of the past. The attempt to compare present conditions with those which might have obtained under better and more ideal systems of working has a useful purpose; but it is of much importance to compare the progress that has been made in matters of agriculture and commerce during the phases that are past, in order to appreciate the improved circumstances of the present. This will provide encouragement for the future, and will make for the attainment of knowledge by which the progress to come will be still more stimulated and hastened.—*Agricultural News.*

Under section 4 of the Madras Planters' Labour Act, 1903, the Governor of Madras has authorized Mr. Edmund Hardy, of Ossington Estate, the Nilgiris, to witness the execution of labour contracts.

Under section 4 of the Madras Planters' Labour Act, 1903, the Governor of Madras has authorized Mr. John Charles Carson Parker, General Manager of the Wynaad Tea Company, to witness the excution of labour contracts.

The Planters' Chronicle.

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(INCORPORATED.)

The Annual Meeting.

There is every probability that the 1911 meeting will be held towards the end of August, the 28th of that month having been suggested as a convenient day for opening the proceedings. The meeting is likely to be an exceptionally important one.

It may be well to remind planters that any of them who happen to be in Bangalore will be very welcome at the meeting, even though they do not come as delegates from District Planters' Associations.

The Scientific Officer.

Mr. Anstead, who is now in North Mysore, is expected to return to head-quarters in the beginning of the second week in June.

He may possibly proceed on tour to the Shevaroys in June or July, but nothing has yet been settled about this.

Mysore Dasara Exhibition.

Extracts from the prospectus of the Mysore Dasara Industrial and Agricultural Exhibition, 1911, are given in the "Official Papers" section of the present number (p. 312). It may be stated here that:

Exhibits that have already won prizes at a previous Mysore Exhibition are precluded from competing for prizes this year.

Samples of Rubber should weigh at least ½-pound.

The medals offered for this product are—gold, silver, bronze.

Pepper samples will only compete for a money prize—Rs.5.

Coffee should be in samples of 2 seers each, and gold, silver and bronze medals are offered.

Cardamoms should also be in lots of 2 seers each. Silver and bronze medals are offered.

Tea—two pound samples are required, and silver and bronze medals will be competed for.

Planters may also be able to send in specimens of Fibres, Fodder Plants, Honey or Beeswax.

No entrance fees are charged; and, as previously stated, it would be a good plan if planters would first send in good displays of their staple products to the little U. P. A. S. I. Exhibition to be held, in connection with the Annual Meeting, about the end of August, and then permit their exhibits to be sent on to Mysore, where they would have a prospect of winning medals or prizes.

Notes and Comments by the Scientific Officer.

110. *Tea Blister Blight.*—The report of the Imperial Mycologist on the outbreak of this disease on Tea in the Darjeeling District in 1908-09 was published in the *Planters' Chronicle* (Vol. V, p. 303). At present we have not got this disease in Southern India, but, as I pointed out when lecturing at Ootacamund, (*P. C.*, Vol. VI, p. 172) we have at present absolutely no means of forcibly preventing its introduction. A short while ago I had an opportunity of discussing the matter with Mr.. McRae, now Government Mycologist stationed at Coimbatore, and he most emphatically advised that all tea seed obtained from Northern India, and from the Darjeeling District in particular, should be treated with a fungicide before it is sown. He assured me that it is quite possible to introduce the disease through the medium of spores clinging to the seeds, or in the earth and packing materials. I trust therefore, that for the good of the planting community as well as for themselves, all planters who import seed from these districts will bury, or better still burn, all the packing, wrapping materials, soil, &c., in which the seed has travelled, and well soak the seed for one hour in a solution of one part of Corrosive Sublimate in 1,000 parts of water. This solution is produced by dissolving 1 lb. of Corrosive Sublimate, which it must be remembered is extremely poisonous, in 100 gallons of water, or 1 oz. in 7½ gallons of water. The seed after this treatment may be either sown at once, or if it is required to be stored it may be dried. The treatment will have no deleterious effect upon the germination.

111. *Fuel Trees.*—Referring to my Note No. 106 on this subject, a correspondent writes, " Knowing that you are looking out for the quickest growing trees in the forest for fuel, I am writing to give you the names of one of the largest, and at the same time the quickest growing, trees known in the Malnad forests. I know the tree to grow as quick as the Silver Oak, at the same time putting on girth, &c. It is the *Melia dubia*, known as the " Heb bevu ! Bushels of seed could be obtained at this time of year."

This tree is more correctly *Melia composita*, and is popularly known as the ' Giant Neem ' in distinction to the ordinary Neem. It is a tall tree of rapid growth, with bi-pinnate leaves, the leaflets being opposite and narrowly ovate. The flowers are greenish-white and fragrant. Cameron thus describes it, " This is the giant Neem of the Malnad forests. It attains a very large size, and can easily be distinguished from the Neem of the plains by its darker foliage and doubly pinnate leaves. It is said to be deciduous also. Although light and not very durable, weighing about 25 lbs. per cubic foot, the wood is generally employed on estates for buildings and agricultural implements."

As seed is said to be easily obtainable this tree might be experimented with as a fuel. Gamble states that it should be cultivated on account of its rapid growth.

112. *Peradeniya Results.*—The following extracts from the Progress Report on the Peradeniya Experiment Station from January 12 to March 16, 1911 are of interest :—

" An experiment to determine the quantity of oil which could be obtained from husked and dried Pará Seeds by means of the chekku mill resulted in 17·75% of oil being expressed ; the residue was an oily poonac which would not bind ; there was practically no loss of weight."

" *Manihot dichotoma* has given a small increase, the general average being about ¼ oz. per tree per month.

RUDOLPH D. ANSTEAD, *Planting Expert.*

PLANTERS' PAPERS.

IV - Green Bug in Coffee.

Notwithstanding the heavy and prolonged rains Coonoor enjoyed during the last N. E. Monsson, leading to the hopes expressed by our Sc. O. that this pest will be less in evidence in the current year, virulent attacks of young bug may be seen on almost any estate that is afflicted with the pest, and unless vigorous measures are adopted, and where adoted now persevered in, hopes are likely to be sadly disappointed, we feel sure.

We last wrote of "Spraying" *versus* "Brushing" in June 1910. At that time "Bug" had already played sad havoc with young berries and caused a loss of a large percentage and weakened a larger, yet the adoption of regular spraying has resulted in much gain to us in total of crop picked, and what is of far more importance, the vigour of trees for the next crop. The gain has been marred by the severe and prolonged cold and by the unprecedentedly severe drought through which Coonoor is still passing.

We have found it quite possible to keep 17 acres of Coffee clear of "Bug" with the following :—

1 Good Sprayer (we now use the "Four Oaks") 1 man and a boy on Rs.12 a month, spraying for roughly 150 days in the year, and using daily

1 lb. of Washing Soda, costing delivered $10\frac{1}{2}$ pies

1 lb. of Rosin of a common kind, delivered 21 pies,

and have discarded the use of Soap altogether as being unnecessary. This saves a lot in supervision and watching, for however much coolies dislike soap when they pay for it, the case is otherwise when it can be obtained by breaking the Commandment!

The cost then works out as follows :—

Labour at Rs.12 for 6 months (150 days)	...Rs.	72	0	0
Material at $3\frac{1}{2}$ pies per day for (150 days)	... ,,	24	9	9
Cost on 17 acres at Rs.5-11-0 about...	Rs.	96	9	9

The first cost may be double or treble of this, if the whole area be badly affected, but once got under the above is, if anything, over the actual cost. We shall be glad to allow personal inspection and inquiry at Carolina, Coonoor, by anybody interested, who is prepared to approach the subject with an unprejudiced mind, and who is earnestly inclined to learn, and to benefit the Planting Community.

We would like now in this connection to quote from page 83 of Mr. Lefroy's "Indian Insect Pests" and to accentuate the fact that the Book was published in 1906, and the information made available to us long before that by personal visits and demonstrations of Mr. Lefroy.

"Rosin has for many years formed the principal ingredient of many excellent washes for sucking insects. When boiled in water with a suitable chemical, rosin dissolves, forming a clear brown wash which can be safely applied to plants at a strength . . . . " a rosin wash of this kind on drying forms a varnish, which asphyxiates some insects by closing the stigmata on the sides of the body through which they obtain air.

We would like to accentuate the fact that the results of spraying on the "Bug" are not to be noticed in a few hours as with brushing (where it is presumable some of the bug is even brushed off mechanically, to work up again) but for days and almost a week after. We have observed that the bug crawls into the varnish and is entangled even as the flies are by "tangle-foot" and that the drops of stuff gradually percolate down the tree

in every direction, slowly in moist weather as is naturally to be expected. Not the least part of the advantage over brushing is that all bark is covered with a spray, which is hardly the case with brushing, particularly when one is not there to watch.

We have on 30 acres of Coffee 2 sprayers at work near the Hallacarry Village, the figures of which work out to the same lines as here given.

As regards crop. We picked on the whole 47 acres less than one ton last year, and $2\frac{1}{2}$ tons in the current year, with abundant promise of complete restoration of the Coffee to its old condition, which, however, here we would state was never very good, for the produce at no time topped $3\frac{1}{2}$ tons, in all, in the past 8 years, during all of which time the "Bug" has steadily made headway, not entirely uninterrupted, for measures of doubtful utility and great cost were followed, of which more anon, should it prove interesting to your readers.

Vigorous manuring operations and the old style of pruning have, with the confidence gained in the results of the spraying, been adopted, and success or failure shall be honestly reported for this paper.

Coonoor, 17 May 1911. THOS. BROWN.

COFFEE INVESTIGATIONS.

Dr. P. S. Cramer, head of the Department of Agriculture in the Dutch West Indies, has reported on his investigation of the virescence in, or deformation of, the flowers of *Coffea arabica*—Arabian coffee. This degenerate condition takes various forms. The flower may be reduced in size until it resembles a small green star. Or again the flower may be almost white, with undeveloped pistils and anthers and rolled petals. As a rule the ovaries of virescent flowers do not develop. Dr. Cramer concluded that virescence was not due to a parasite, but was a physiological phenomenon due to the plant's lack of nourishment. This may be the result of climatic, pathological, or soil conditions. The removal of excrescences on the trees, a judicious system of pruning, and the planting of shade trees are recommended, together with the growth of legumes and protection of the land from erosion.

COFFEE AND COFFEE DISEASE.

An article in *L'Agriculture Pratique des Pays Chauds*, No. 91, p. 337, gives a short account of some of the efforts that are being made in the French colonies against *Hemileia vastatrix*—the most destructive fungus pest of coffee. In Reunion, it seems, these are chiefly concerned with the employment of solutions containing sulphate of copper, which are applied three times in quick succession, at intervals, without waiting for the appearance of the disease—a treatment that has met with encouraging success during the two or three years in which it has been tried. Added to this, for the better success of the method, planters are paying more attention to the use of manures for increasing the power of resistance of the trees, and are receiving useful assistance through the employment of judicious pruning. In the Comoro Islands, efforts to combat the disease have been restricted so far to the introduction, to some extent, of Liberian coffee (*Coffee liberica*), mainly because the production of coffee is regarded as a secondary industry. It is in Madagascar where the most conclusive results have been obtained through the introduction of resistant varieties. Liberian coffee grows successfully, but its special characteristics lessen the interest in it. The greatest success has been obtained with *Coffea congensis* var. *Chalotti*, and then with *C. canephora* var, *opaca* and *C. javanica*.

INDIAN TEA ASSOCIATION, CALCUTTA.

Extract from Abstract of the Proceedings of a Meeting of the General Committee, held at Calcutta on the 9th May, 1911.

Entry of Foreign Grown Teas into China.—The rumoured exclusion of foreign teas from China was last referred to in the proceedings of the meeting held on the 11th April 1911. When the rumour was brought to their notice in March, the General Committee approached the Government of India with regard to it. Enquiries were made by Government, through the Secretary of State for India, and the result of these was communicated on the 29th April. It was to the effect that the rumour was not confirmed.

The Committee had expressed their thanks to the Government for the action taken, and they now directed that the papers should be recorded.

In his letter dated 21st April 1911, Sir James Buckingham, Secretary to the Indian Tea Association (London), drew attention to a statement made in the proceedings of the meeting held on the 17th March 1911. This was to the effect that the dust and fannings sent from Calcutta to Hankow are compressed into "tablet" teas. Sir James Buckingham enquired if the term "brick teas" was not intended. He mentioned the matter because the Russian customs duties for "tablets" and "bricks" are not identical; the rates for the former being much higher than those for the latter.

The Committee directed that enquiries should be made into this point, and the results reported to them.

Scientific Department.—Dr. G. D. Hope, the Chief Scientific Officer of the Association, was present at the meeting and submitted the following report upon his recent visit to the Darjeeling district:—

(1) During April I toured in the Darjeeling Tea District and visited the following gardens:—

Tukvar Singlo	Tukvar Badamtam	Dooteriah Kalej Moondakotee	Ringtong	Margaret's Hope
Nahor	Dilaram	Springside	Castleton	Bannockburn
Ging	Teesta Valley			
Tukdar.				

During my tour I collected *data* bearing on two investigations which are at present occupying my attention:

(1) green crops and their suitability to certain soils and districts and,

(2) tea-chest woods and their susceptibility to attacks of boring beetles.

In addition to this I enquired as far as was possible, while moving about from place to place, into the question of the falling off in the quality of Darjeeling tea of recent years. The question is one which is exercising the minds of Darjeeling planters and it was suggested by several men that it should be taken up by the Scientific Department.

(2) I am about to hand in the text of a lecture which I gave at the Planters' Club, Darjeeling, on March 25th, and that of a discussion which took place afterwards to the Secretary of the Association for printing.

(3) Boring Beetles in Tea Chests.

In order to investigate the question fully I am making enquiries in collaboration with Mr. Antram in order to determine :—

(*a*) the extent to which the different species of wood used for tea-chests are susceptible to attack by borers.
(*b*) the effect of seasoning, age of the wood, etc., on this.
(*c*) the amount and nature of the seasoning which tea-box woods usually undergo.
(*d*) whether the attack of borers takes place
  (1) in the growing timber
  (2) in the felled log
  (3) after the timber is cut into shooks.
(*e*) the species of borers which cause the damage, their names and life-histories.
(*f*) whether any treatment of the wood such as would render it immune to attack is feasible.
(*g*) what effect such treatment might have on the lead of tea-chests.

As far as my enquiry goes it appears—

(1) that patent chests are usually free from borers.
(2) that attacks by borers take place after the timber is cut into shooks at the saw-mill, and while being stored in the wood-shed and factory, and not on board ocean-going steamers.
(3) Simul of all tea-chest woods undoubtedly is most susceptible to attack, particularly the light coloured sap wood. Soft woods are more easily attacked than harder woods, and all woods may be attacked.
(4) the susceptibility of woods to attack seems to be very much dependent on the seasoning. Tea boxes are found to be damaged more towards the close of the season than earlier. This is presumably due to the stock of seasoned wood having come to an end and unseasoned wood being used instead.

(4) I am at present occupied in translating several Dutch papers on tea manufacturing. A pamphlet containing digests of these and results of our own work on the subject will appear shortly.

(5) Mr. P. H. Carpenter, the Assistant Scientific Officer, has recently been for a short tour in the Dooars. He visited the following gardens :—

Bhatkawa, Dima, Kalchini, Chuapara, Rungamuttee, Dalsingpara, Birpara, Dalgaon, Demdima, Huldibarie, Gandrapara, Chulsa, Matelli, Sam-Sing, Nakhati, Meenglas, Sylee, Bagracote, Phulbarie, Washabari, Ellenbarie.

I am about to continue my tour in Cachar and Sylhet.

Dr. Hope also mentioned to the Committee that the Jorehat Tea Co., Ld., had consented to lease sufficient land at Tocklai to enable the Association to establish a Central Experimental Station there. As was explained in the Proceedings of the meeting held on the 11th April, Mr. P. H. Carpenter, the Assistant Scientific Officer, will be located at this station, as will be also an Entomologist and a Mycologist. The necessary buildings will be erected as soon as possible, and will consist of a well-equipped laboratory and two bungalows.

TEA.

Ceylon Tea on the Continent of Europe.

MR. J. H. RENTON'S REPORT FOR 1910.

The Tea Trade on the Continent in 1910 has been fair.

In Sweden and Denmark importers report good progress, more especially in Denmark. In Norway the consumption of tea seems to make no headway.

In France, although the general consumption of tea makes no progress, that of Ceylon goes quietly, though slowly, ahead. Those importers who make Ceylon a speciality seem quite satisfied with their trade and all report a small increase, which, they say, would have been greater, but that prices have been too high, to compete favourably with China sorts.

The same complaint comes from Austria: Ceylons are getting too dear and the retailer of pure Ceylons finds it impossible to increase his price, notwithstanding the fact that he has to pay more for his teas. It is true that the direct export from Ceylon to Austria shows a falling off, but this is solely due to the increase in the export from London. The Vienna importers complain strongly that they have made a trade in Ceylon which is being taken away from them by London houses, who call their blends, Ceylon Tea. It matters little to us through what channels the tea goes into the country, though we are naturally sorry that those who were the first to introduce a new article do not reap where they have sown, owing to others selling blends under the name of Ceylon. I also have complaints from Vienna that it is now impossible to get really fine Ceylon tea, no matter what price one is willing to pay.

The Tea Trade in Germany in 1910 has not been a favourable one for the importer. In the first place there was the general dulness caused by the absence of demand. I pointed out in my report for 1909 that the large increase in the deliveries from Bond was mainly due to the heavy clearances which were made to avoid payment of the increased duty which came into force in August, 1909. A comparison of the Customs, returns for the two years shows how the public had provided itself with sufficient stock to last for months :—

Increase in the deliveries in		1909	Java Tea was	29	per cent.
Decrease	do	1910	do	38	do
Increase	do	1909	China Tea was	25	do
Decrease	do	1910	do	39	do
Increase	do	1909	Ceylon Tea was	15	do
Decrease	do	1910	do	29	do
Increase	do	1909	Indian Tea was	14	do
Decrease	do	1910	do	34	do

It will be noticed from the figures I give later on that the *exports* of Indian tea in Germany show a decrease of 45 per cent while those of Ceylon show one of 17 per cent. only.

Then secondly the spring of 1910 was very mild, and it is always the cold weather which gives a fillip to the consumption of tea in Germany. Thirdly, the pronounced increase in price especially of the commoner kinds made itself felt in the course of the year. Vendors of pure Ceylon teas were compelled to put up their prices, while retailers of blends got out of the difficulty by increasing the proportion of China without altering the price.

I have before me several letters addressed to German importers by their retail clients pointing out how much cheaper London houses are offering Ceylon Teas. From the prices quoted it is quite apparent that the Teas cannot be pure Ceylon or contain more than 25 per cent. of the commonest Ceylon.

I regret that a Company calling itself the Ceylon Tea Company and trading in Bridge Street, Ludgate Hill, has caused the German Police to issue a warning cautioning the Public to beware of its advertisements. The German Newspapers head the warning: "Beware of Tea Swindlers."

The firm in question issued a big advertisement offering 2lb. of finest Ceylon Tea value 10 marks for 5·50, and offering 250 and 100 marks as prizes for the correct solution of a riddle which they appended to their advertisement. The answers to the riddle had to be sent in by a given date accompanied by an order and cash remittance for 2lb. of tea. I fear the Police notice has caused the good name of Ceylon tea to suffer, as the notices appeared in practically every important newspaper in Germany.

I have only paid one visit to the Continent of six weeks in 1910. There are no new schemes now to be considered and all the money is being spent on aiding the campaign of those who push Ceylon teas.

The moneys spent in Roumania and Denmark were in payment of the completion of the 1909 programme.

In Germany our expenditure has been on the usual lines, such as distribution of free samples to private houses accompanied by circulars and price lists. This is by far and away the very best form of propaganda; advertisements in the local newspapers on behalf of all the retailers who keep the teas; the distribution of fancy canisters and tins at Christmas time. The only new feature of this year's campaign has been the special columns inserted in the newspapers containing one or more paragraphs about Ceylon and its tea. The tour in the East of the Crown Prince of Germany was used for all it was worth to bring in a reference to Ceylon and its tea. The state of the tea trade, the cultivation of the tea plant, the preparation of tea were all used as subjects for small newspaper articles, and these were inserted mostly gratuitously in over 2,000 newspapers and magazines. A few newspapers declined to insert the articles, others insisted on a payment as it was perfectly apparent that they were advertisements pure and simple, but the whole cost so far has only amounted to £70. In this way Ceylon tea has been quite as widely advertised as Indian tea has been by the large and costly newspaper advertisements which must have cost thousands of pounds. Some of our agencies show a small decrease in sales, Wiesbaden is 500 lb., Hamburg 600 lb., Dresden 660 lb., behind last year, but others again have done better: Breslau has recovered part of the decrease of 50 per cent. in 1909, as 1910 shows an increase of 46 per cent. In the Frankfort business, sales of dry tea have been better, but the expenses of the tea room run away with all the profits and the owner does not seem inclined to keep the tea room open after 1911, and proposes to give it up and confine himself to his wholesale and packet trade.

Since the commencement of this year the clearances from bond in Germany have been double those of the corresponding months of last year.

Detailed figures of the Exports to the Continent are not yet available. So far as available the exports from London and direct from countries of origin excluding transhipments are as under:—

	India.		Ceylon.	
	1909	1910	1909	1910
To	lb.	lb.	lb.	lb.
Germany ...	3,618,679	1,981,382	1,472,866	1,221,803
Holland ...	1,230,548	1,386,795	446,052	415,266
France ...	120,956	121,887	853,632	935,949
Rest of Europe excluding Russia & Turkey...	1,542,164	1,962,377	2,245,200	2,272,001

The German Customs Returns are:—

Country of Origin.		Deliveries. 1909 kilos.	1910 kilos.
From Great Britain	...	83,800	70,200
do British India	...	687,000	454,200
do Ceylon	...	443,700	314,900
do China	...	2,878,600	1,743,700
do Java	...	798,900	492,600

I have received the French Customs Returns for 1908, but not those for 1909. They are as under:—

Countries of Origin.		Deliveries. 1907 kilos.	1908 kilos.
From Russia	...	7,421	5,455
do Great Britain	...	133,023	138,239
do Belgium	...	710	592
do British India	...	230,366	252,234
do China	...	464,071	426,770
do Other Countries	...	8,680	19,134
do Indo-China	...	309,002	292.567
do Other French Colonies		1,235	150
		1,154,884	1,135,101

In Austria the Customs returns reveal a curious position. The imports were smaller than in the two previous years, yet the clearances for home consumption were larger than they have ever been. Stocks in first hands must therefore be considerably depleted. No doubt the high load of prices caused importers to buy less and draw more on their stocks in bond.

I have omitted to mention that the Oriental Exhibition in Munich proved a failure. The summer was not favourable, being too cold and wet. Visitors were attracted to Oberammergau and the Exhibition in itself was poor. I am very sorry as no expense was spared to make the Ceylon Tea Kiosque pretty and attractive. The Munich Tea Room continues to be well patronised and is doing well.

A small Tea Kiosque was opened at the Cookery and Food Exhibition held in Stuttgart in the summer and did well.

J. H. RENTON.

24th March, 1911.

P. S.—The deliveries of Tea in Germany to end February this year are as under:—

From Great Britain an increase of		...	3,300	kilos
do India	do	...	20,800	do
do Ceylon	do	...	32,000	do
do China	do	...	144,200	do
do Java	do	...	70,100	do

Over the two corresponding months of last year.

February 22nd.

The Manager, Ceylon Tea Co., New Bridge Street, London, E.C.

DEAR SIR,—I beg to annex for your information translation of a notice

published in the German newspapers by order ot the President of the Police :—

" With reference to the advertisement appearing in the German newspapers with the headlines in heavy type ' Do you wish to make a hundred or two hundred and fifty marks' ? published by a Company calling itself the Ceylon Tea Co., Newbridge St., London, E.C., in which 100 marks is promised to anyone who guesses the correct answer to a riddle appearing in the advertisement, and at same time orders 2 lb. of Ceylon Tea of a value of 10 marks for 5·50, it appears from enquiries made that the enterprise which disguises itself under the name of the Ceylon Tea Co., is carried on in a very small office on 4th floor of a house in the Street indicated. Its principal business consists apparently in advertising. No guarantee or probability exists that the money promised will be paid."

I very much regret that the German police have thought it necessary to issue a notice in the papers with regard to any advertisement in connection with Ceylon Tea and trust you will at once take the necessary steps to discontinue your advertisement.– I am, Yours faithfully,

J. H. Renton.

Feb. 23rd, 1911.

Ceylon Commissioner for Europe, 5, Whittington Avenue, London, E.C.

Dear Sir,—We beg to acknowledge receipt of your favour of Feb. 22nd the contents of which somewhat surprised us. Your request to discontinue our advertisement seems somewhat *ultra vires*, but we attribute the same to your legitimate desire to preserve and watch the interests of the country you represent.

Regarding the value of the police notice which you mention, we beg to say that the same is entirely due to the lack of intelligence of the person who wrote it.

For your guidance we may mention that we have placed the matter in the hands of a Berlin solicitor and have also communicated with the British Consul in Berlin.—Yours faithfully,

Ceylon Tea Company,

F. Wright,

Manager.

The Indian Tea Industry.

The Outlook.

The Grocer remarks :—" The outlook of the Indian tea industry is now more favourable than has perhaps been experienced for many years. The question of over-production, which has previously from time to time confronted growers, need not, for the present, cause anxiety to the trade or the general public investing in tea. In consequence of the opening out of new markets and the expansion in the Indian tea trade with foreign countries, together with an increased consumption at home, supplies are becoming insufficient for the world's requirements, the position being further strengthened by the reduction of stocks in practically all markets where British grown teas are consumed. The future may be anticipated with a greater degree of confidence than for many years past."

COFFEE.

The Market.

In their monthly market report dated April 29, 1911, Messrs G. Duuring and Zoon, of Rotterdam, remarked:—"The sales for account of the State of Saô-Paulo were the principal feature of the month. A quantity of 1,200,000 bags sold within three weeks has been absorbing the interest of the trade. Spot quotations have been almost unchanged, although prices occasionally ruled in buyers' favor, under the weight of the valorisation sales and cheaper cost freight offerings."

The Committee charged with the management of the State of Saô-Paulo Government coffee, announced with reference to the sales of 1st and 22nd April, that the following average prices were realized:

On 1st April:

600,000	bags Santos and Rio in	New-York $12\frac{3}{4}$ \$*cts.* basis Santos No. 6.	
125,000	,, ,,	Hamburg and Bremen	58·75 *pf.*
117,500	,, ,,	Hâvre and Marseilles	73·90 *frs.*
12 500	,, ,,	Trieste	71·20 *kr.*
25,000	,, in	Antwerp	74·12½ *frs.*
20,000	,, ,,	Rotterdam	35·40 *cts.*
900,000 bags.			

On 22nd April:

122,500	bags Santos and Rio in	Hamburg and Bremen	60·16 *pf.*
117 500	,, ,,	Hâvre and Marseilles	74·88 *frs.*
10,000	,, ,,	Trieste	70·86 *kr.*
25,000	,, in	Antwerp	75·83 *frs.*
25,075	,, ,,	Rotterdam	35·28 *cts.*
300,075 bags.			

As the Committee held a firm offer on the basis of frs. 75, good average Hâvre type for the sales of 22nd April, prices were fixed in accordance.

It is understood that the greater part of the Coffee offered was allocated to the makers of the firm offer, the trade not having been willing to pay higher prices than those of the 1st April.

No more Government Coffee is to be sold this year.

Writing on the 19th ultimo, the Hamburg correspondent of the *Economist* reported:—

"Brazilian cost and freight offers with higher limits seemed to indicate that primary markets were inclined to hold the remaining supplies pending the result of the public sale of the remaining 300,000 bags of this year's quotation of valorisation coffee. The disappointing result of the auction of 20,000 bags Brazilian by the Dutch Trading Company—which disposed of only 15,000 bags on the basis of 54*s.* and 54*s.* 6*d.* for cost and freight for superior Santos, and withdrew 5,000 bags owing to the poor bids—was offset by Brazilian cables. These stated that one of the largest firms connected with the valorisation was bidding for futures at Santos: that receipts at the ports would be small for two or three months yet because the year's crop was quite exceptionally late. . . .

"The country is buying little, and the theory of exhausted supplies is rapidly losing what little influence it may have had. The splendid financial results of the companies manufacturing substitutes seem to indicate that the consumption of same is gaining ground quite considerably. Brazilian crop news is as conflicting as ever. The market has had estimates this week of 12½ million bags minimum, and others of 10½ millions maximum."

RUBBER.

Soil Fertility and Rubber Cultivation.

Mr. W. T. Gibson has contributed the following special article to the *India-Rubber Journal* :—

Soil fertility depends partly upon the action of bacteria that bring about the decay of the nitrogenous bodies in organic debris, the final products being ammonia or nitrate, or that manufacture nitrogenous plant food from the nitrogen of the air. Yet to the behaviour of soil bacteria in the humid tropics very little attention has been given, and we are reduced to applying knowledge gained from the study of soils in the temperate zone, where the conditions as to heat, moisture, and soil chemistry are so different.

In temperate zone soils many kinds of bacteria occur and in enormous numbers. Some carry the process of decay no further than to produce ammonia, or rather, compounds of ammonia, a process known as ammonification. By other bacteria the ammonia may be altered in two stages to nitrate, a process known as nitrification. Of the bacteria absorbing nitrogen from the air and forming it into plant food there are two groups. One group lives in swellings upon the roots of leguminous (pod-bearing) plants, such as tephrosia and crotalaria, supplying them with nitrogenous food in a form of which we are at present ignorant. The other group lives independently in the soil and forms nitrate.

It should be said also that plant food, as ammonia, is elaborated from debris by beneficial fungi, which may perhaps be very important agents in tropical soils. Further, other beneficial fungi receive the credit of absorbing nitrogen from the air and of making it available for plants. But these fungi, as a rule, do not enter into the calculations of the soil investigator, too little is known about them, and they develop most successfully under conditions to which the agriculturist of the temperate zone objects.

His principal aim is to encourage the formation of nitrate rather than to allow the alteration of the nitrogenous matter to stop at the ammonia stage. As a whole, the methods of doing this equally encourage the free-living bacteria working upon atmospheric nitrogen. In attaining this object he is guided by the practice of past generations, who knew nothing of the soil bacteria, but who unconsciously aided them to produce their best results, and he is guided also by the work of the scientific investigator. Recently, the latter has been enquiring into the power of enhancing soil fertility exercised by agents that, curiously enough, have sterilising effects, and are therefore inimical to bacteria.

It has long been known, as it was to the ancients, that subjection of the soil to some degree of heat, by burning branches, leaves, or manure, mixed with it, makes it much more productive. Not only is this practice adopted in Europe, it seems also to be carried out to some slight extent on Eastern plantations under European management. On the alluvial plains of India the ryots expose the soil during the hot, dry weather of April and May to three sterilising agents—dryness, heat and sunlight—and yet the effect on the subsequent crops is extraordinarily beneficial, resembling that got by nitrogenous manuring. Even a chemical sterilising agent is effectual, as was first observed some thirty years ago, when an Alsatian vinegrower, having sprayed the soil against phylloxera with carbon bisulphide, noticed an increase in its fertility.

Upon such a basis there has of recent years been much experimentation. For example, heating the soil to 95° c. before sowing the seed has produced crops two, three, or four times as large as were obtained from

untreated soil. And increases in fertility, amounting in some cases to between thirty and fifty per cent., much less than by the heating method, have been got by using in addition to carbon bisulphide the following agents: chloroform, carbon tetrachloride, ether, benzene, xylene, toluene, phenol (carbolic acid) cresol, creolin (a preparation of cresol), tricresol, carbolineum, petroleum, naphthylamine, pyrogallol, hydrogen peroxide and arsenic.

How bacteria-killing methods could enhance the fertility of the soil, so dependent upon the work of bacteria, remained a mystery until the matter was taken up at the Rothhamsted Experiment Station by Russell and Hutchinson. Having excluded all other possible factors, they finally decided that the above methods were responsible for the destruction of some organisms injurious to the bacteria. And untreated soil being searched, various kinds of microscopic animals were found that prey upon them and that also compete with them for food. When soil is heated to 95° c., all of these animals are killed. When it is treated, say, with toluene, all are killed except some of the smaller. By either method the whole of the active bacteria also are killed, but there remain uninjured the spores of certain kinds, which develop into active bacteria that, in the total or relative absence of their animal enemies, rapidly proliferate and attain numbers far above those in untreated soil. In the case of soil treated with toluene, after five weeks they may be five to eight times as numerous as in the untreated. The result is a great activity in the alteration of the organic debris with the formation of larger quantities of nitrogenous plant food. That some of the obnoxious animals persist in the chemically-treated soil explains its smaller fertility as compared with that of the heated soil.

The humidity of certain tropical soils will favour the development of these animals, which are necessarily inhabitants of water, so that these new methods of soil treatment are of great interest to us. But no small amount of experimentation will be necessary before the above methods can be used upon tropical plantations. There is satisfaction in learning that a start has been made, for some experiments are being carried out by Giles and Loew in Porto Rico. Upon this tropical island, with a large rainfall over certain areas, some coffee and sugar-cane soils have ceased to become productive; in particular some sugar-cane land has been yielding only eight tons per acre in spite of thorough cultivation, fertilising, liming, and fallowing. In the belief that the cause is mainly abnormality in the bacterial population, chemical treatment is being followed with cresol, tricresol, creolin, carbolineum, and other of the cheaper agents. And though the soils are abnormal, we may be certain of the discovery of facts that will guide us further.

The chemical methods of treatment do not appear very feasible upon Eastern plantations. The cost of materials will be a serious item to be lessened when perhaps their manufacture is begun in the East. But where at present the soil for nurseries is prepared by burning with it branches and the like, soil sterilisation, so-called, is carried out upon most efficient and economical lines. The burn-off on newly-cleared estates, as ordinarily carried out, is possibly too violent to be efficient.

In the experiments of Russell and Hutchinson, as has been said, the spores of certain kinds of bacteria alone survived. They were the spores of bacteria that produce ammonia; the bacteria making nitrate, together with their spores, were killed. Such accelerated growth as took place was therefore due entirely to an abundant supply of ammonia, in the absence of nitrate. This utilisation of ammonia is not a new fact, for it has been shown that many plants do as well upon it as upon nitrate, while some plants live under conditions where they cannot get the latter. What makes this fact

interesting is that there is some doubt as to whether nitrate-forming soil bacteria can develop successfully at all seasons in the humid tropics, for if they do not play any important part the principle of soil sterilisation loses what many may consider one of its disadvantages, the idea of nitrate-formation having a strong hold upon some minds. Therefore the question of nitrification in the humid tropics deserves discussion in a little detail. And if the discussion is not very conclusive, there is something gained in having the question opened up.

At the outset we are met by the important fact that the soils, cultivated as well as uncultivated, are usually acid in reaction to litmus paper, often markedly so. Now in the temperate zone acidity is not desired, for the development of nitrate-forming bacteria is then depressed and nitrification. For example, European forest soils, which are generally acid in reaction, contain little nitrate or none. And any nitrification taking place in acid soils, according to Hall, Miller and Gimingham, is near to particles of calcium carbonate, which modify the acidity in their neighbourhood. Yet some kinds of tree can flourish on very sour soil, sufficient nitrogen being available in another form, as ammonia, if nothing else. For ammonification is possible under such conditions of acidity as make nitrification impossible or nearly so, and it is performed not only by bacteria but also by beneficial fungi, which live exceedingly well in acid soils.

Another difficulty in the way of nitrification is the excessive humidity of the soils. In the temperate zone this is unfavourable to the process, for it demands a sufficient supply of oxygen. The air is partly driven out of the soil by the water, and the oxygen is only slightly soluble in the latter, still less soluble at tropical temperatures. Yet these higher temperatures may induce the more active absorption of the smaller amount available. And in this connection it is noteworthy that, although nitrogen also is less soluble in water at tropical temperatures, and is partly occluded by the water in the soil, the leguminous plants thrive in the humid tropics, so that their associated bacteria must be able to elaborate nitrogen freely. An indirect effect of the excessive humidity is the encouragement of soil acidity. Ammonification is not hindered by the humidity, but rather is helped.

The Dutch Government Bureau for the India-rubber Trade and Industry.

Dr. J. G. Van Iterson, Junior, writing to *Tropical Life*, draws attention to the following scheme, formulated by the Dutch Government for the benefit of all concerned, sellers, buyers, and consumers.

"No doubt your readers are aware that, since May 15th, 1910, a Bureau for the india-rubber industry has been established at Delft (Holland) by the Dutch Government. This Bureau has been founded to decide upon methods for testing rubber in a raw, as well as in a vulcanized state, and also to supply the rubber trade and industry with all the information possible.

"Without undervaluing the great practical experience that rubber importers and manufacturers have acquired in the course of the past few years, it is acknowledged by the majority of experts, and it is also the strong conviction of the Bureau, that the basis on which the trade in raw rubber is at present carried on is very imperfect as regards the valuation of the raw rubber, since the basis is decidedly not in accordance with the progress which science has made of late years.

"Nowadays the valuation is made on the outward appearance only, and is therefore founded on empiricism, with all its defects. The amounts of moisture, resin, inorganic and organic impurities cannot be satisfactorily

determined in this way, and there is no denying that the knowledge of these particulars is of such importance to the rubber manufacturer that, sooner or later, he must obtain it. They can only be determined by the aid of analytical chemistry. It is true that the quality of the raw rubber is not determined by this alone, as the mechanical properties, or elasticity, &c., are of great importance when valuing. The Bureau is therefore glad to say that it will be shortly in possession of the necessary machines and apparatus to determine these physical properties; and as the methods for the determination of these are still imperfect, investigations by experts will be carried out with a view of improving them.

"Although there can as yet be no question of perfectly reliable valuations in a scientific way, it would be desirable to examine whether it would be of use to all who are interested in raw rubber to have the results of an analysis of the raw rubber offered for sale. In order to obtain a clear insight into this matter, the Bureau, with the permission of the Minister of Agriculture, Industry and Trade, will analyze all samples of rubber, gutta-percha and balata during the months of February, March and April of this year free of charge and give a certificate of the results of this analysis. This chemical analysis will consist of: (1) Determination of moisture; (2) determination of resins; (3) determination of igorganic impurities; (4) determination of organic impurities. Samples weighing from ½ to 1 kilogram must be forwarded post paid to the Bureau, 81, Oude Delft, Delft, Holland.

"These samples must, as much as possible, agree with the average composition of the parcel, and the senders are recommended to see that this is the case. The Bureau cannot be responsible for the choice of sample made by the sender. Part of the sample will be used for the analysis, another part will be kept by the Bureau as a control-sample, and a third portion will be returned to the sender, duly marked, with the certificate of the analysis. This last part can be shown with the certificate when the rubber is offered for sale. If the sender wishes to have more marked samples of the same parcel, the sample must be larger in proportion. The Bureau expects, together with the sample sent, a complete account of the name, origin, &c., of the rubber, and all further particulars which are thought of importance by the sender, so that the certificate can be filled in as completely as possible. As it is well known that parcels of rubber, containing great quantities of water, decrease in weight in the long run by loss of moisture, which will be especially the case with the sample, it is desirable to mention where, and since when, the parcel has been stored, how it is packed (cases, bales, &c.), and the date when the sample was taken. That will enable buyers to conclude how far the amount of moisture of the sample analyzed by the Bureau will agree with that of the parcel. In order to facilitate the senders in complying with this request, the Bureau will send, on demand, forms for filling in.

"At the close of these three months it can be judged how far it is desirable to propose to the Minister of Agriculture that this experimental period be prolonged, or whether the Government can at once issue the necessary regulations authorizing the Bureau to undertake regularly, at a fixed charge, the analysis of raw rubber.

"The Bureau trusts that all who are interested in the raw and manufacturing rubber trade, whether importers, brokers or manufacturers, will co-operate to make this experiment a success. This can be facilitated if those making use of its services will express their opinion and state their experiences and wishes so as to help the authorities to draw up the final regulations."

OFFICIAL PAPERS.

The Mysore Dasara Industrial and Agricultural Exhibition, 1911.

EXTRACTS FROM THE PROSPECTUS.

Opening of the Exhibition.—This year the Exhibition will be opened to the public from the 25th of September to the 15th of October, both days inclusive. The cattle (local) and poultry shows will begin on Wednesday the 4th October and close on Saturday 7th.

Object of the Exhibition.—The primary aim of the Committee is to impart to the Exhibition an educative character and to bring together articles, machinery and processes, the use of which it is desirable to bring to the notice of the raiyat, artizan and the manufacturer by actual demonstration. But as the exhibition of a single specimen may not afford full information and may not be sufficiently attractive to the visiting public, articles intended for sale will also be admitted.

Sale rooms and sale of exhibits.—Articles on a larger scale sent merely for sale will have to be kept in separate stalls and in charge of the exhibitors or their agents. There is no objection to the sale of actual exhibits; but they will not be allowed to be removed from the Exhibition grounds till the termination of the Show. Articles admitted for purposes of sale alone may be removed after purchase. No article will be allowed to leave the Exhibition grounds without a gate pass. Those who desire special facilities for the sale of articles or demonstration of processes, are requested to place themselves in communication with the Secretary to the Exhibition Committee.

Horticultural Show.—The horticultural show comprising Class II, Group 2, items 1 to 7, mentioned in the first section of the Prospectus, will be held on the 4th of October 1911 and kept open till the following day.

Lectures.—Written notes on subjects connected with Agriculture and Industry will be thankfully received and printed in book form for distribution at the Exhibition.

Demonstrations.—Arrangements will be made for holding a competition on the Exhibition grounds in Ploughing, Weaving and Pottery work, Carving and Metal work. The exact time of demonstrations will be announced later on by hand bills and notices.

Donations.—The Committee will thankfully accept donations for awarding prizes or medals from individuals or associations desiring to give an impetus to any special branch of agriculture or industry.

Classification of Exhibits.—The classification of exhibits will be according to the prize list subjoined to the Prospectus and entries in several sections should be made in the application forms prescribed.

Open to all India.—The Committee invite exhibits from all the districts of the State as well as from outside. They also appeal to the various agricultural departments and associations in other parts of India, Burma and Ceylon to help them with exhibits and suggestions.

Judges.—Leading raiyats and non-official gentlemen will be invited to assist the Committee in judging the exhibits.

Admission fees for visitors.—An admission fee of annas two per head will be levied each time a person enters the Exhibition buildings. Season Tickets will be issued at Re.1-8-0 per head. These are not transferable, but books of eight single tickets may be had also at Re.1 per book. Return railway season tickets between Bangalore and Mysore at a reduced rate which will also admit to the Exhibition for the whole period, will be arranged for.

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(INCORPORATED.)

Prevention of Thefts of Produce.

In a letter dated the 24th May, 1911, the Chief Secretary to the Government of Madras, Judicial Department, writes :—

" In continuation of letter No. 1228-1, dated 3rd March, 1911, I am directed to state that the Government have given their consideration to the suggestion for the enactment of a special measure for the protection from theft of rubber, tea, pepper and cardamoms, but regret that they do not find that there are sufficient grounds to justify the special legislation desired by the Association."

Extradition.

Writing to the Planting Member of the Madras Legislative Council, under date March 8, 1911, the Chief Secretary to the Government of Madras, Judicial Department, remarked :—

" I am directed to reply to your letter dated the 30th August 1910, in which was forwarded for the consideration of Government copy of a Resolution passed at the annual meeting of the United Planters' Association of Southern India to the following effect :—

" ' That the Government of Madras be approached with the view of ascertaining clearly whether extradition will be automatically obtained on the adoption of Act I of 1903 by Planters in Native States, or whether it would be necessary to have special alterations made in existing Treaties with such States.'

" 2. As regards the first point raised in the above Resolution, I am desired to call your attention to the wording of section 44 of Act I of 1903, which runs as follows :—

" ' 44. The Local Government may, by notification, order that processes issued by the Courts, or by any specified courts, in a Native State under any Act for the enforcement of labour contracts in force in such Native State shall subject to such conditions and restrictions as may in such notification be prescribed be executed within the Presidency of Madras as if they were processes issued under this Act.'

" It is clear that this section leaves entire discretion to the local Government to issue such a notification or not as they may deem expedient, and that therefore it is not the case that extradition would *automatically* follow on the adoption of Act I of 1903 by Native States. Legislation on the lines of that Act is however an essential preliminary to the issue of a notification under the above section, and, I am to say that if this condition

were satisfied, the Government would be prepared to give their careful consideration to any representations made on behalf of the planting interest with reference to the execution in this Presidency of processes issued by courts in Native States. As regards the further point raised in the resolution of the United Planters' Association of Southern India I am to say that the issue of such a notification would not necessitate any special alterations in existing treaties with Native States.

"3. You enquire, further, whether provision could be made for reciprocity between Native States and for the service of British Courts' warrants in Travancore and Cochin. In reply to the first of these questions I am to say that should any two of the Native States subject to the jurisdiction of the Madras Government desire the reciprocal execution of processes arising out of labour contracts the Government would be prepared to consider their request provided the States concerned had brought into effect within their respective boundaries legislation similar to Act I of 1903.

"4. As for the service of British warrants in Travancore and Cochin, I am to say that this is not expressly provided for by treaty but it is not anticipated that any difficulties would arise in arranging for such services if considered advisable.

"5. You desire also to be informed whether the 'considerations and restrictions' referred to in section 44 of Act I of 1903 can now be explicitly defined. I am to say that, apart from the essential preliminary already referred to, *viz.*, the enactment by Native States of an Act similar to Act I of 1903, the Government are unable at present to say exactly what these conditions and restrictions would be, but apart from other considerations they would certainly deal with the classes of courts having power to issue such warrants, the offences for which the warrants might be executed in British territory, and the procedure by which they might be tried.

"6. I am finally to observe that it would be necessary to lay the whole matter before the Government of India before any orders could be issued."

A New District Planters' Association.

The Bababudin Planters' Association has been constituted in the Mysore State, with head-quarters at Chickmaglur, and has applied for affiliation to the U. P. A. S. I.

Reported Assassination of Dr. Olsson-Seffer.

This paper has had occasion to quote from time to time extracts from useful scientific papers contributed to contemporaries by Dr. Pehr Olsson-Seffer. It has now to chronicle the following report published in the *India-Rubber Journal* of May 6, 1911 :—

"A private telegram received yesterday (Thursday) from Mexico City, states that Dr. Pehr Olsson-Seffer, the well-known authority on Castilloa and Mexican rubber generally, has been assassinated. No particulars are added.

"A Scandinavian by birth, Dr. Olsson-Seffer did most of his work in Mexico, where he was one of the first to engage in Castilloa rubber cultivation.

"He was connected with a number of United States companies formed to cultivate this tree, and was Special Government Commissioner for Investigation of Economic Products of Mexico. His contributions to the literature of Castilloa and other Mexican rubber are numerous and important. Among his discoveries may be noted a new Plumeria, yielding a very good grade of rubber, and a new Jatropha containing rubber."

Scientific Officer's Papers.

LXV.—The Control of Scale Insects by Means of Fungoid Parasites.

In the *Planters' Chronicle* last year, (Vol. V, p. 571), there was published an account of the work that was being done in the British West Indies to control Scale insects by means of their natural fungoid enemies. The 'Green Bug' *(Lecanium viride*, or to give it its revised scientific name, *Coccus viridis)* is attacked in South India by a white fungus which during the monsoon and wet weather kills off enormous numbers of them, and during the protracted wet weather last year this fungus almost cleared the Coffee of scales, and the attack this year, despite the lengthy drought, has been much less severe than usual.

When it comes to using the fungus directly, however, the difficulty of propagating it in the dry weather appears to be insuperable. In the Report of the Ceylon Government Entomologist for 1908 he says: "A certain white fungus was found to be attacking and killing the insects (*Lecanium viride*). This fungus, I am informed by the Mycologist, is difficult of propagation and does not lend itself for use as an insecticide."

In a recent number of the *Agricultural News* the following interesting account of recent work in the West Indies with fungus parasites on scale insects is published. The method adopted of tying up sprays of fungus-infected scales in trees attacked by scales has been tried here, with success in the wet season. The dry weather, however, defeats any attempt to use the fungus in a practical way, and it must be remembered that in the West Indies the rainfall is more equally distributed throughout the year than in South India with its months of drought.

The 'Black Blight' mentioned as being so prevalent in Grenada is common here also. The black, soot-like appearance is caused by a fungus which grows in the sugary excretion from the scales. (See *P. C.*, Vol. V, p. 223).

"Experiments have been conducted recently with the shield scale fungus (*Cephalosporium lecanii*) in Barbados and Grenada, which furnish some interesting additional information; while general observations in Grenada have indicated the advisability of paying careful attention to one or two matters which will be mentioned below.

"*Grenada.*—As is well known, many of the trees in this island have been subject in recent years to bad attacks of scale insects, attended by black blight fungus. These are found on very many different trees, but are commonest on the mango. The scale insects chiefly associated with the black blight fungus, on whatever species of plants it occurs, are the soft shield scales, members of the genus *Coccus*, which are persistently attacked by the shield scale fungus. In consequence of this, experiments were undertaken wtth a view to extending as widely as possible the distribution of this useful fungus throughout the island, as it was known to occur there, but appeared to be limited to the Botanic Gardens and their neighbourhood, at the extreme leeward end of the island. The Superintendent of Agriculture sent out packages of leaves bearing specimens of soft shield scales attacked by the fungus, with the request that they might be tied carefully into any big mango tree on the estate to which they were sent, provided that the tree was badly infected with black blight. A request was also made that any results obtained as regards freeing the tree from black blight and scale insects might be carefully noted. In addition experiments were conducted under the direction of the Superintendent of Agriculture for the purpose of

extending the distribution of the fungus in the Botanic Gardens themselves. As a result of these experiments, the fungus has become definitely established at two localities in the interior of the island, and its distribution in the Botanic Garden has been extended. The trees on which it has spread successfully have been almost entirely freed from scale insects and, in consequence, are not nearly so severely affected with black blight. It was noted, moreover, that the fungus had spread to a species of scale insect that it had never been known to attack before, namely the mealy shield scale (*Pulvinaria pyriformis*), which occurred on a Cinnamon tree in the gardens.

" Although the fungus mentioned cannot yet be said to have attained anything approaching universal distribution in the island, yet the experiments show that this much desired result might be attained, by means of diligent and persistent effort, in a reasonably short space of time.

" *Barbados.*—In November 1910, the Superintendent of Agriculture observed the shield scale fungus attacking the black scale (*Saissetianigra*) on some branches of Hibiscus, and made use of this material to infect the green and mango shield scales (*Coccus viridis* and *Coccus magniferae*) on guava and mango plants at the Botanic Station at Dodd's Reformatory. The results were so satisfactory that similar experiments were conducted at Queen's Park, and these were also attended with success. In fact, in February, the Superintendent of Agriculture reported that it was difficult to find in the infected trees scales which were not attacked by the fungus.

" Information as to the discovery made in Grenada that the shield scale fungus could attack the mealy shield scale was communicated by the Imperial Commissioner of Agriculture to the local Department of Agriculture, Barbados. As a result, examination was made in February of certain trees at Dodd's Reformatory, of Java plum (*Eugenia Jambolana*) and rose apple (*Eugenia Jambos*), on which this scale was known to be living, and it was found that individual insects were attacked by the fungus in that locality, also. In order to hasten the spread of the parasite, the Superintendent of Agriculture caused certain branches of the Barbados cherry (*Malpighia glabra*), on which the scale insects had been destroyed by it, to be tied into the Java plum and rose apple trees, with the result that the spread of the fungus has gradually increased.

" These experiments afford most striking confirmation of the results that might be expected in consequence of careful and well directed applications, not only of the shield scale fungus, but also of all the species known to destroy scale insects in these islands.

" *General Considerations.*—One of the most important points requiring consideration when employing these fungi, is that they have not yet become distributed throughout the whole of several of the islands. Consequently, where this is the case, if their spread is left entirely to natural means, it may be many years before their benefit becomes at all evident, and in certain cases, their effect might never be so large as to be of much practical service. Thus, in order to obtain the best results as quickly as possible, every effort should be made to increase their distribution artificially by means similar to those indicated above. This effort, moreover, must be sustained, the infection experiments being repeated until they are definitely successful.

" In conducting these experiments, certain points should be remembered. The trees chosen for infection should be situated at the windward end of the district to be treated ; this applies especially to narrow valleys. The material should be tied in at the top, and on the windward side of the trees ;

while it is advisable also to cause the infected leaves to come into fairly close contact with the under sides of the leaves to be infected, as it is on the under side of the leaf that the majority of the scale insects occur.

"Again, even when infection has been established, it is possible that after an interval reinfection may become necessary; for if all the scale insects are killed the fungus dies, so that a new attack of insects will make it necessary to introduce more fungus.

"Even when a given fungus has become well established in an island, efforts to increase its prevalence by artificial means will almost certainly be necessary, in order to ensure that its spread keeps pace with that of its hosts. This is particularly the case in seasons unfavourable to the fungus, which are bound to be of periodic occurrence.

"Although there is need of continuous effort and of sustained artificial encouragement in order to induce these fungi to do the work required of them, yet there can be little doubt of their economic usefulness. It may be added that no such sustained effort has yet been made, so that the present condition of affairs cannot be taken as any criterion of the possible effect of these parasites in controlling the scale insects of the West Indies."

In an article on 'Fungi in Relation to Agriculture' published in the *Agricultural News* of 28th May 1910, it is stated :—

"Other species (of fungi) can live on harmful fungi, and are useful in this way, while still others are parasitic on various insects of economic importance and are, even under natural conditions, of great importance as a supplementary means of keeping such insects under control.

"The recognition of this last point is of comparatively recent date, and the observations and experiments that have been carried out so far tend to show that it is of primary importance in the control of certain insect pests in tropical and subtropical climates. The parasitic fungi may be readily encouraged by various means, and under such circumstances afford a way of controlling such pests, which is very much cheaper, and at the same time more effective, in many cases, than any of the artificial methods in common use at the present time. The employment of parasitic fungi in the control of various pests is at present, comparatively speaking, in its infancy, but there can be little doubt that, should this method fulfil, in the future, the promise held out by the results of experiments conducted up to the present time, it will prove of the utmost service to the practical agriculturist."

RUDOLPH D. ANSTEAD,
Planting Expert.

Conference on Castilloa Rubber in Jamaica.

On January 3rd, 1911, a conference of Departmental officers and planters interested in the culture of Castilloa rubber in Jamaica was held at Hope at the invitation of the Director of Agriculture. The objects in view were, first, to report progress as to the yields of rubber that had been obtained from established trees in various parts of the island, secondly, to consider the question of varieties and the desirable species for trial in Jamaica, and lastly, demonstrations of tapping by the most experienced operators.

It was stated that demonstrations of tapping on some 7 year old trees at Hope showed the great convenience and utility of the new "Thompson" tool for tapping Castilloa trees.

DISTRICT PLANTERS' ASSOCIATIONS.

The Bababudin Planters' Association.

The First General Meeting of the Bababudin Planters' Association was held at the Kadur Club, Chickmaglur, on the 20th May, 1911.

PRESENT.—Messrs. Raikes, Johnson, Kerr, Lincoln, D. Meppen, Hugonin, Kirwan, F. D. Meppen, H. Allardice. *Visitors.*—Messrs. Evetts, Watson, Strongvist, Thomson and Foster.

Mr. Hugonin was voted to the Chair.

Proceedings of the Preliminary Meeting having been read and confirmed, the rules as drafted by the Committee were duly read and accepted and passed accordingly. The voting for office-bearers resulted as follows :—

President	... ...	Mr. A. C. W. Denne.
Vice-President...	...	„ F. Hugonin.
Hon. Secretary	...	„ N. B. Kirwan.

ANGLO-AMERICAN DIRECT TEA TRADING CO.

The twelfth annual report of the Anglo-American Tea Trading Co., Ltd., shows a profit of £88,854. The directors propose to pay a dividend of 6 per cent. on the Cumulative Preference Shares, and 9 per cent. on the Ordinary Shares, and carry forward £2,092.

The tea crop was 5,932,461 lbs., against a yield in 1909 of 5,803,447 lbs. The cocoa crop was 1,628 cwts. The coffee and cardamom crops amounted to 6,735 cwts, and 42,747 lbs. respectively, while the outturn of rubber was 90,827 lbs. The average price secured for the tea crops is 7·78*d.*, which is ·19*d.* higher than that obtained in 1909. The rubber crop was 10,827 lbs. in excess of the estimate, and it has been disposed of at an average sale price of 6*s.* 4*d.* per lb.

The area under plants is now 16,824 acres, consisting of 11,866 acres of tea, 1,694 acres of coffee, 1,235 acres of Pará Rubber in separate clearings in Ceylon, and 250 acres in the Anamalais Hills of South India, 928 acres of cardamoms, 741 acres of cocoa, 50 acres of cinchona, 50 acres of camphor, and 10 acres of cocoanuts. The company has also about 164,000 Pará rubber trees planted through its tea in Ceylon.

KANAN DEVAN HILLS PRODUCT CO., LTD.

The fourteenth annual report of the Kanan Devan Hills Produce Co., Ltd., states that the profit for the year amounted to £98,672 and the credit balance from last year was £2,432 5*s.* 11*d.* From this has to be deducted interest, discount on bills, etc., commission on profits, £23,021 3*s.* 2*d.*, leaving £78,083 8*s.* 11*d.* to be dealt with. The directors have written £15,000 off Block Expenditure Account, transferred to Insurance Reserve Account £3,000, and recommend dividends of 6 per cent. on the Cumulative Preference Shares, and 5 per cent. on the Ordinary Shares, leaving £7,583 8*s.* 11*d.* to be carried forward.

The planted area of the company's estates is now 18,622 acres, *viz.*, 16,572 acres of tea, 271 acres of coffee (all interplanted with tea), 681 acres of cinchona, 580 acres of rubber, 405 acres of sisal and 113 acres of camphor. It is proposed to plant out 485 acres of tea and 100 acres of rubber in Travancore during the current season.

The authorised capital of the company has been increased to £1,500,000 since the close of the financial year, by the creation of 35,000 six per cent. Cumulative Preference Shares of £10 each, and 15,000 ordinary shares of £10 each. An issue of 30,000 of these Preference Shares was made in March, and was fully subscribed.

COFFEE.

Particulars Regarding the Curing of Coffee in Guatemala.

[CONTRIBUTED BY HERR GUSTAV HELMRICH, FINCA SAMAC.]

[For this original contribution from a well known authority on coffee cultivation in Guatemala, the *Planters' Chronicle* is indebted to the friendly offices of Messrs. Peirce, Leslie & Co., Ltd., of Calicut, and of the Kali Syndikat, for whom the above firm are agents in the planting districts of South India.

Some of the results of manuring experiments made by Mr. Helmrich are shown in the coloured plates published in this number.

The footnotes to the article are Messrs. Peirce, Leslie & Co's.

Mr. Helmrich has also sent a number of illustrations of the various pulping and other machines to which he refers in his paper. In fact, he has responded in a very liberal spirit to the request that was made to him, that he would kindly furnish detailed information concerning the methods of coffee-curing in vogue in Guatemala; and this opportunity is taken by the Editor to tender warm thanks to the writer of the following paper, and to the Kali Syndikat and Messrs. Peirce, Leslie & Co., Ltd., through whom it was obtained.]

The question of Coffee curing and the machinery required for the purpose would soon cease to exist if this produce were to be sold in the world's market solely according to the taste and not, as it is at present, in most cases, according to the appearance. Most discerning Planters are of opinion that Coffee which is dried in the pulp and only after driage has the pulp removed and is then stored until its appearance is anything but beautiful has a finer and more aromatic taste flavour than Coffee which, in the fashion of the present day, is cured according to the "wet" process. Looked at from this point of view, those smaller Planters in Guatemala are justified in their action who prepare most of the Coffee which is required for local consumption in the more primitive manner by drying the Cherries in the sun on mats, pounding them afterwards in a mortar, and finally removing the chaff by means of fans. This method, taken in conjunction with the large crushing machines used where the quantities to deal with are larger, represents the Alpha and Omega of this "dry" Coffee preparation process.

In Guatemala the "wet" process has been found the most suitable for the larger Coffee Works, for the simple reason that in most cases the necessary quantity of running water is available or, if not, water can be stored in cisterns during the actual rains when the rainfall runs from 2,000 to 4,000 millimetres (inches 78·74 to 157·48). When quantities of rain like this are available it is clearly more economical to remove the pulp fresh, as in that case loss in weight will not amount to more than about 50%, and beyond that on the average this washed Coffee fetches a better price than the dry pulp Coffee by about 15 Marks [say 14*s.* 7½*d.*]

I now invite the reader to visit in my Company the works of a Coffee Estate in Guatemala. I assume that water power is available and it only remains to be seen what kind of motor is being used. In this matter the following considerations should guide the Planter.

1. The "Pelton" Water Wheel is preferable where little water with a high fall is available; on account of its acting by stroke.

2. The Turbine in order to be worked most effectively naturally requires exactly the volume of water for which it has been calculated.

3. The overshot Water Wheel can be made from timber on the spot and with the Pelton Wheel even an irregular quantity of water will give fairly effective work.

The first thing one notices on entering the works is that the ground is laid out in terraces. The room in which the Coffee is received is situated at the top. From there the Coffee in pulp is passed into the pulping machine by a stream of water. From the pulping machine it is led into a separator, which takes out that Parchment which is not quite clean; the parchment which passes the separator then goes into basins where fermentation takes place, the time allowed being 36/48 hours according to the weather; this parchment goes into washing basins or washing machines and the stream of water which cleans the parchment in these takes it on to the terrace made of masonry which is lower down and in front of the place where the machinery is situated; the parchment is then dried on these terraces, the time taken being about 5 or 6 days. As far as many planters are concerned the coffee is then ready for export, this meaning that they prefer to ship their coffee in the parchment, as this protects it against moisture and other inclement influences during transport. In this case it is only at the place of destination that the husk is removed from the Coffee, and the Coffee is garbled by hand. An obvious drawback, however, about shipping the Coffee in the parchment is that about 20% more freight is paid unnecessarily. In addition to this, it will be much more expensive to remove the husk and garble Coffee at the port of destination than if it were done in the original Coffee Works.

As far as the works which we are now visiting are concerned our friend possesses the necessary machinery to prepare his Coffee entirely for the market. He reduces his expenses, as he also undertakes the curing of the crops of his smaller neighbours. Next to the machinery room we find a room in which 40 Red Indian girls are busy picking out the pulped *Coffee. He tells us that they do piece work and he also advises us that the outturn is according to the size of the beans, which are separated by a machine into first, second, third and P. B. classes. Each girl works through about 100/150 lbs. per day.

Let us now return to the machines. We see on them the label of the firm of Messrs. Marcus Mason & Co., and our friend informs us that this firm has just recently supplied the machinery for the Fincas in Costa Rica which are well known for the high price their Coffee obtains in London. In the Estates in the neighbourhood he informs us we would find also machinery from Messrs. John Gordon & Co., London, or German machines from the Grüsonwerk, Magdeburg-Buckau. All these manufacturers supply very capable working machinery. The only one thing that the Planter has to see is, that he selects from the various catalogues the machine most suitable for his purpose and uses it properly and works it with care. It should, for instance, be observed as a rule that the plucked Coffee be pulped on the same day that it is harvested; if the pulp dries and sticks to the bean the Pulper will not be able to do its work thoroughly and the parchment will come out of the machine with pulp sticking to it; also the friction plate of the copper cylinder will wear out more rapidly. A movable sieve is fixed up behind the machine. Only clean parchment falls through the meshes of this into the fermenting basins, while the parchment with pulp sticking to it is either sent back through the Pulper again or washed on direct to the lower lying terraces.

[* We presume that Mr. Helmrich refers to Coffee which has been peeled, but he has not so far mentioned any peeling process.—P. L. & Co.]

Our friend informs us that on some Estates the whole crop ripens at the same time so that it is impossible to keep pace with the harvest, especially if heavy showers of rain combine to delay the work; part of the crop will then get overripe on the tress. In this case instead of movable sieves a sieve of cylindrical shape is substituted which runs half under the water and manages to complete the work of properly pulping Peaberries, which would otherwise not pulp properly.

The pulp which is removed from the Coffee cherries contains an appreciable quantity of sugar, and successful trials have been made in the State Laboratory of Guatemala to produce spirit from it. As a manure also it contains according to analysis in every 1,000 parts the following :—

Water	178·0
Nitrogen	8·6
Phosphoric	25·6
Potash	489·9
Lime	95·4

The basins behind the pulper which are used for fermenting the Coffee would appear at first sight to be unusually large; so does the terrace for drying; but our guide points out that they are worked out in correct and known proportions as follows :—

One kilo. fresh pulped parchment requires about 1,000 cubic centimetres in the basin while for every quintal parchment one square metre of the drying place is required. Accordingly he has built for the drying of every 1,000 quintals a terrace 50 metres in length by 20 metres in breadth with a slope in the latter direction of 12½%.

All the fermenting basins have an outlet to the washing basin, which is much flatter than the former. In this way the workmen who wash the Coffee by moving it to and fro have more space for the work. Consequently the work of the washing machine moves more quickly and at the same time it requires less water. This is a cylinder into which the Coffee is introduced by water. In the cylinder there is a shaft turning to which shovels are fixed. The shaft or axle chafes the Coffee and presses it out of the machine on the other side. Every sort of work can in fact now-a-days be done by machinery.

For a long time past in Guatemala the drying drum "Guardiola" has frequently replaced the capricious sun. The Coffee which is to be dried is encircled by hot air in this rotary drum for 36 hours. The hot air is blown into the drums by fans. It appears very tempting to dry the Coffee in such a short time, but this method has its disadvantages, as the slightest irregularity allowed to take place in the temperature of the drum causes the colour of the produce to deteriorate. The drying ground serves as a useful substitute when it is necessary to bring the harvest into such a state that if it has to be stored for a time it is not exposed to the danger of turning mouldy, but the final drying should be done in the sun if at all possible.

We have now crossed the drying terraces and have left behind us the department in which the parchment is prepared according to the "wet" process. As soon as the parchment is once dried it must be the principal care of the Planter to see that his produce does not again absorb any moisture. For this reason pulping, fermenting and washing basins are generally in one room, while the machinery for the final curing of the Coffee is in another building. The pulping *machine which has been placed here serves the purpose

* (Peeler?).

of removing the parchment husk and the silver skin from the Coffee bean; exhaustors draw off as quickly as possible the dust and chaff which arises during this process, so that the natural colour of the bean may not suffer.

As mentioned in the beginning, this machine has also to do the work of a mortar in the preparation of Coffee dried in the pulp or of Coffee the pulp of which is by nature especially hard. In this machine the beans are pressed against rough friction plates. We see this arrangement in the pulping machine "Engelberg," which is very suitable for such kinds of Coffee, while on the other hand the smooth "Smout" by Gordon & Co., takes its place when the Coffee has been washed nicely, or in other words in the case of clean parchment. By a corkscrew-like shaft or axle the Coffee beans are at the same time cleared of chaff and polished. Then come the classification drums which separate the Coffee into the various grades and from these the Coffee goes into the hands of females and is then placed in bags of 100 or 150 lbs., which are weighed and then stitched and marked.

Down in front of the works a number of mules have arrived to take the Estate Coffee to the Railway Station. Our friend finds that 6 bags have still to be stitched, after which all mules will have a full load. We put on leather gloves, take needle and twine, and within 10 minutes the bags have been stitched. It is a special pleasure for us to tell our friend that the only thing wanting in his Coffee Curing works is an appliance whereby bags can be stitched, as in all other respects his works are fully equipped for every process.

Guatemalan Crops.

The forecast for the present (1910-11) crop is, according to a consular report, about 781,000 quintals of clean coffee.

During the past year the bulk of the export (or about 61 per cent.) went to Germany, most of the remainder going to the United States, which took 25 per cent., and the United Kingdom (9 per cent). The total, calculated as clean coffee, amounted to 881,626 quintals.

Reduced Consumption of Coffee.

The decline in the consumption of coffee, which has been so marked a feature of late, is due to causes temporary rather than permanent. The maintenance of high prices for the lower kinds of coffee, also the unusual delay in the Budget statement which has caused buyers to operate with caution, are responsible for the deficiency in deliveries compared with last year. For the first seventeen weeks of the present year, London deliveries for home use were 639 tons below those in the same period of last year. The general position of the market has undergone no change during the past month. The valorization sales have absorbed the interest of the trade, and prices have been fairly well maintained on the spot, although "to arrive" some irregularity has prevailed on cheaper c. and f. Santos offers. Conflicting reports have been circulated as to the next Santos crop, but have received little attention until this week, when estimates were put forward, indicating very large Brazil crops for next year. As regards mild coffee it is probable that supplies will turn out smaller than the earlier estimates. Competition at the auctions has been extremely good for the finer qualities, especially finest coloury sorts, which are scarce, and have realised extreme rates; but the poorer kinds are in only limited demand, and quotations are barely maintained. As soon as the present state of uncertainty in connection with the duty is removed bnsiness should become more active.—*The Grocer.*

RUBBER.

Soil Fertility and Rubber Cultivation.

Continuing the paper quoted from the *India Rubber Journal* in last week's issue of the *Planters' Chronlcle* (Vol. VI, No. 21, p. 308) Mr. W. T. Gibson writes:—

At the end of the first part of this article there were mentioned some difficulties in the way of nitrification in tropical soils.

A further difficulty is that, owing to the heavy rainfall, the alkaline earths and alkalies (lime, magnesia, potash, soda) are extensively washed out of the soil, which therefore is frequently poor in them. Nitrate cannot be formed without these bases, the burden falling apparently most heavily upon the lime. The lime content is usually very low, and how far the other bases can replace it is a matter of some obscurity, though we may learn in the future that they are more useful in tropical soils than in the temperate, yet what is present of the bases must be readily available and is not to any extent locked up in compounds difficult to decompose, as witness the luxuriant growth upon these tropical soils, a growth impossible were the trees and plants unable to obtain enough mineral food.

This luxuriant growth, the admiration of Europeans, of course implies also an abundant supply of nitrogenous food. And in view of the soil acidity, the excessive moisture content with the consequent bad aeration, and the poverty in mineral bases, which in the temperate zone would together practically stop nitrification, we are driven to the conclusion that the necessary nitrogen is absorbed to a very considerable extent in the form of ammonia. There may be something fitting in this. For the principal rubber-yielding trees (Hevea, Manihot, Castilloa and Ficus) and cocoa, Coffee and Assam tea are in a state of nature all forest dwellers. And while their forest-dwelling habit may be partly due to the inability of their seeds and seedlings to withstand much exposure in the open to a powerful sun, these economic plants, if we may argue from analogy with what happens in the soils of European forests, must be accustomed to the utilisation of ammonia. Further, again arguing from analogy with conditions in the temperate zone, there is an advantage in that ammonia is more firmly retained by the soil, a strong advantage in regions of heavy rainfall.

But it must not be assumed that the case thus made against nitrification is intended to disprove its existence; that would be futile in face of facts proving the contrary. The purpose is to show that in the humid tropics it probably plays a smaller part in soil fertility than at home.

That the nitrifying bacteria of the temperate zone prefer soils neutral in reacton is not sufficient to enable us to assert that this is true of the same kind of bacteria found in the tropics. There are samples of soil bacteria performing similar functions that live in differently reacting media, *e.g.*, the bacteria associated with the leguminous plants. An alkaline soil best suits some of these plants, an acid soil others; and the presumption is that their respective bacteria are as well suited. And it is noteworthy that some leguminous plants live successfully in the tropics under what must be markedly acid conditions.

The higher temperatures may render nitrification easier in acid soils, or, on the contrary, more difficult; it is impossible to say. But along with the characteristic chemical conditions of tropical soils, and the decided humidity, they will certainly encourage a bacterial flora quite different in its composition to the floras of the temperate zone. And as the processes going

on in a soil depend upon the co-operative action of the various kinds of bacteria in it rather than upon the isolated action of any, some differences in these processes may be expected, so that we must not argue too closely by European standards.

Bacteria responsible for one or other of the stages in nitrification as well as others elaborating atmospheric nitrogen, have been found in samples of soils coming from the humid tropics (Java, New Guinea, Cameroon, etc.), that have been examined in European laboratories. This was to be expected, but what we want to know is the relation between the activity of these bacteria and the reaction of the soil.

And, of course, nitrates occur in soils of the humid tropics. Detmer examined four samples of surface soil from Java plantations, in three cases the corresponding subsoils also. Ammonia was present in all of the samples, and in one surface and one subsoil sample (from a different area to the surface sample) was nitrate present. It is highly probable that *in situ* the soils were acid, for they were poor in bases, and the region is one of abundant rainfalls. Dealing with the peaty, "bhil" soils of Assam, Bamber found nitrate in small quantities in five out of nine samples, and of one of the five samples he records that it was slightly acid when moistened; another was exceedingly acid.

In discussing this question of nitrification, I have not given any special attention to the subsoil, and the possibility that it may differ from the surface soil deserves some notice. Though Hevea is a surface feeder as far as its lateral roots are concerned, some of these lie in the subsoil. And while in the case of some soils one may hesitate to say at what level the subsoil begins, the point is that the conditions below differ from those at the surface. It is rarely in the temperate zone that nitrification goes on more freely in the subsoil, and we may safely believe the same true for the humid tropics. Owing to the relatively greater content of water and the lesser supply of oxygen, subsoils are generally more acid than surface soils, and the more deficient aeration together with the acidity, directly inhibit the process. Further, in the humid tropics the subsoils are usually poorer in the necessary mineral bases, and they are poorer also in nitrogenous debris. There is no opportunity here for extensive nitrification.

How far the process is a factor in the soil fertility of rubber plantations is a matter very difficult to decide. And though with all the facts before us we are led to believe that nitrification is possible under conditions of somewhat greater acidity than in the temperate zone, we are, as before remarked, forced to the conclusion that the greater part of the nitrogenous plant food is absorbed as ammonia.

The maintenance of a very moderate state of soil acidity will have its advantages. Acids assist in liberating mineral food from the soil particles, apparently encouraging the formation of compounds whose bases are easily seized by the roots. This greater availability of the bases is an important factor in favourable growth. It has already been mentioned that ammonia is less easily washed out of the soil than nitrate. Further, rubber trees were originally forest-dwellers, and have therefore been accustomed to somewhat acid conditions, so that the policy may be doubted by which they are to be placed at once under the same conditions as highly cultivated plants of the temperate zone. Yet acidity must never be more than mild, otherwise the roots will be directly injured, the formation even of ammonia will be hindered, and there will be encouraged the development of injurious root fungi.

I am aware that to suggest the toleration of any degree of soil acidity is rank heresy in face of the improvement in growth obtained in European forests and on Eastern rubber plantations by sweetening the soil. But it is a question of degree. And, at any rate, as tropical soils are so peculiar, differing so much from soils of the temperate zone in their chemical behaviour, what applies to the one cannot apply in the same degree to the other.

There are reasons why one should not carry out too boldly methods of lessening the acidity or sourness. The primary cause of this state is the great rainfall, and one of the remedies for acidity is draining. But moisture is a dominant factor in the growth of trees, and it cannot be sacrificed unless there are conditions that absolutely compel the sacrifice. If the soil-water be comparatively sweet and not stagnant, and at a height that leaves a sufficiently thick layer of soil at the surface well aerated, it can be conserved, but it must not be peaty, nor should the soil be very rich in iron, when, in the presence of water, the tendency is for the poisonous lower oxides of iron to form.

Liming, another method of sweetening the soil, appears to be difficult to carry out judiciously, and it is especially here that European standards may lead us astray. On the one hand, better and healthier growth after the use of lime on tropical economic plantations is reported, though we are somewhat in the dark as to the exact soil conditions brought about. On the other hand, there are reports of injury to tropical plants by liming and cautions against the exaggerated use of lime or of wood ashes, which are rich in lime and potash. Some of these reports suggest on the face of them an excess of lime or ash that would certainly be harmful in the temperate zone, but taking the evidence as a whole it seems to encourage caution. Strachan stated that the tea-plant does not require much lime, and that it resents too much of it, for bushes look sickly near to which coolies have thrown wood ashes. Privately I learn that Mr. J. C. Tate has observed in Sumatra that the growth of tobacco is not good where wood ashes have been left, though in some quantity, but the growth becomes excellent after perhaps two years. And I learn from the editor that a similar evil has been noticed elsewhere. Mohr remarked the beneficial effect of wood ashes upon tobacco in Sumatra but was against their being too freely applied. Kobus and Marr noted that on most of the sugar cane soils of Java, which are generally poor in lime and potash, additions of these bases had no affect or even a harmful one, though this may be partly explained by their supply in the water used for irrigating rice-plants that were grown in alternate seasons with the sugar canes. In a later communication Marr cites some very curious cases of deterioration of Java soils by addition of lime, and suggests tropical conditions as the underlying factor. Of the sub-tropical parts of Japan, it was held by Fesca that, in spite of the poverty in lime, there was small need for it. Along with this evidence set the fact, observed in many quarters of the humid tropics, that coffee, cocoa, and other economic plants grow successfully in soils poor in lime, and that without its application. This evidence lacks an important quality, for as a whole data as to exact quantities are absent, so that we are a little in the dark; but there is much here to prevent our interfering too boldly with soil acidity by the use of lime.

Root disease may possibly be hindered by soil sterilization, when that is brought about by the use of chemical agents; and it is of interest that carbon bisulphide and petroleum oil residues have been tried as remedies for the disease, but apparently have not received much attention.

SOILS AND FERTILISERS.

Fertilisers.

Further extracts from Mr. C. M. Conner's paper in the *Philippine Agricultural Review* (*vide P. C.*, VI, No. 17, pp. 243/245) are given below :—

Fertilisers, as generally purchased on the market, are prepared for certain classes of crops and in many cases for one particular crop, such as zacate, vegetables, sugar-cane, fruit trees, etc. There are very few, if any, natural fertilisers that can be applied to growing crops with profit without the addition of certain other elements, in order to make a balanced ration for the plant, unless the soil should be rich in some one or more of the elements. Many of the materials used in making these mixtures are what may be called standard ; by this we mean that they do not vary to any great extent in their composition and are frequently referred to by name in speaking of the composition of fertilisers. In order that the reader may be more or less familiar with some of these materials the following list is given, together with such explanation as may be needed in order that one may clearly understand the nature and composition of the material.

Sources of some of the Raw Materials used in the Manufacture of Artificial Fertilisers.

NITROGEN.

Nitrate of Soda.—This comes principally from the mines of Chile and is frequently known as Chile saltpetre. The raw nitrate of soda is mined, dissolved in water, and recrystallised. It is fairly constant in its composition and usually contains about 16 per cent. of nitrogen, but owing to the fact that it takes up some water in a moist climate only 15 per cent. should be counted upon here. Nitrate of soda when dissolved in water is immediately available as plant food, hence it is known as a quick fertiliser. For this reason it is used as a supplement to other fertilisers ; that is, whenever it is found that plants are suffering for the want of nitrogen a small quantity of nitrate of soda applied along the side of the rows will correct the deficiency at once. The effect of nitrate of soda can be noticed in forty-eight hours after it has been applied, in some cases. Plants suffering for want of nitrogen are light green colour and when nitrogen is abundant they take a dark green appearance. As it is very soluble in water, it sohuld not be applied during the rainy season, nor where there is an excessive amount of water, as it will become so diluted that the plants cannot obtain the required amount. In handling nitrate of soda it should not be left exposed to the weather, as it takes up water rapidly and a large percentage will be lost.

Dried blood.—It contains from 10 to 12 per cent. of nitrogen, but its composition is not constant and a guaranty of analysis should be called for befere buying. It is a quick acting fertiliser and very effective.

Sulphate of ammonia.—This is a by-product obtained from the manufacture of coke. It contains about 20 per cent. of nitrogen and when applied to the soil becomes quickly available as plant food. It should never be mixed with lime or basic slag, but should be applied separately or mixed with some other material that will not form an insoluble compound.

PHOSPHORIC ACID.

Acid phosphate.—The bulk of the phosphoric acid used is derived from phosphate rock. At present this rock is found principally in Florida, South Carolina, and Tennessee. The rock as mined is insoluble and, as a rule, is of little value as a fertiliser until reduced to a fine powder and treated

with sulphuric acid. This treatment renders the phosphoric acid available to plants, and also forms considerable sulphate of lime or land plaster. Acid phosphates from ordinary rock contain from 12 to 18 per cent. available phosphoric acid. Acid phosphates containing higher percentages of phosphoric acid are usually obtained by washing the soluble phosphoric acid out of the low-grade phosphate fertiliser and reinforcing the higher grades; these are known as superphosphates. Superhosphates of this character may sometimes contain as high as 45 per cent. of available phosphoric acid.

Bones.—Raw or steamed bones and bone charcoal are frequently used as a source of phosphoric acid. Raw bones contain from 3·5 to 5 per cent. nitrogen and 20 to 25 per cent. phosphoric acid. The composition of the bones varies according to the age of the animal. Practically all the phosphoric acid in bones is available as fast as the bones decay, hence bones to be of value as a fertiliser should be ground fine in order to hasten the decay. Steamed bones are preferable to unsteamed bones, as the steaming removes the grease, etc., which interferes with the decomposition of the bones to a slight extent. In order to make bone meal become available quickly it should be mixed with more or less lime.

Basic slag.—This is a by-product in the manufacture of Bessemer steel. The phosphoric acid content of basic slag ranges from 15 to 20 per cent. The phosphoric acid in basic slag is in what is known as the insoluble form, but when placed in the soil the phosphoric acid becomes available to plants. In using this material it should not be mixed with acid phosphate or sulphate of ammonia. Basic slag usually gives best results when used on sour soils.

POTASH.

Potash salts.—Practically all the potash now used in commercial fertilisers comes from the potash salt mines in Germany known as the Stassfurt mines. These potash salts are found in connection with deposits of rock salt. The forms of potash salts known to commerce are kainit, muriate, and sulphate of potash; there are other forms, but not in general use. Kainit is the raw product as mined and contains about 12·5 per cent. of soluble potash and a varying quantity of common salt. Muriate and sulphate of potash are refined from the low grade salts as mined. Commercial muriate and sulphate each contain about 50 per cent. soluble potash. It should be borne in mind that kainit and muriate of potash should not be used for fertilising tobacco, as the chlorine injures the burning quality of the tobacco. As a rule muriate of potash is cheaper than sulphate, owing to the fact that sulphate of potash is used in manufacturing. In the Philippine Islands it is not advisable to buy anything except the muriate or sulphate, as will be explained later under the head of concentrated fertilisers.

OTHER MATERIALS.

Fish and fish scrap.—Fish have been used as a fertiliser for a long time. In many cases they prove quite beneficial to the soil where they can be obtained in large quantities. There use should be supplemented by the addition of potash and such phosphoric acid as is necessary in order to make their use profitable. Dried fish scrap usually contains from 9 to 10 per cent. nitrogen and 6 to 8 per cent. phosphoric acid.

Natural guanos.—In many parts of the Philippine Islands large deposits of bat guano may be found which contain sufficient nitrogen, phosphoric acid, and potash to make it profitable to mine it, but the composition of these deposits of guano is so variable that a chemical analysis and actual test upon growing crops should be made before attempting to use them extensively.

Use of Leguminous crops.—Leguminous crops, such as velvet beans, mongos, and sitao planted upon the land, either occupying the entire area or planted between the rows of the growing crop, add nitrogen to the soil. As stated before, this nitrogen is collected by the plant through the agency of certain bacteria which live in nodules on the roots. It has been found that a crop of velvet beans weighing 9,605 kilos per hectare if ploughed under and mixed thoroughly with the soil, will return to the soil 64·2 kilos of nitrogen; this is enough nitrogen to last any ordinary crop three years. The nitrogen contained in these vines, leaves, and stems is not immediately available to the growing crop, but as the vegetable matter rots, the nitrogen gradually becomes available and even in this climate where decomposition goes on rapidly the effect would extend over at least two growing seasons. By referring back to the cost of commercial fertiliser per ton it will be noticed that this 64·2 kilos of nitrogen has a commercial value of 57·78. In many of the cane fields of Louisiana, cowpeas which collect practically as much nitrogen per acre as velvet beans, are planted after every crop of cane in order to furnish nitrogen for the next crop of cane in order to furnish nitrogen for the next crop of cane which is to be planted upon the land. In this way the cost of fertiliser is reduced and the yield of cane materially increased. There is no reason why a similar procedure could not be followed in these Islands.

Market value.—The market value of a fertiliser is determined by multiplying the number of kilos of nitrogen, phosphoric acid, and potash in one ton of the fertiliser by the price of these elements per kilo. The price of these elements is determined by taking such standard fertilisers as acid phosphate, nitrate of soda, and sulphate of potash and determination the cost per kilo by dividing the price paid for these materials upon the local market by the number of kilos of the fertilising elements in them. According to the present market price of these materials, nitrogen is worth 90 centavos per kilo, phosphoric acid is worth 25 centavos per kilo, and potash is worth 28 centavos per kilo. From these figures the value of any mixed fertiliser or any fertilising materials may be determined. For example, a ton of fertiliser containing 5 per cent. nitrogen, 8 per cent. phosphoric acid and 10 per cent. potash may be calculated as follows:—

50 kilos nitrogen, at 0·90 per kilo, equals	45·00
80 kilos phosphoric acid, at 0·25 per kilo, equals ...	20·00
100 kilos potash, at 0·28 per kilo, equals	28·00
Bagging and mixing	7·00
Total ...	100·00

The use of concentrated materials.—Since a ton of fertiliser is valued according to the number of kilos. of available nitrogen, phosphoric acid, and potash, the higher the percentage of each, the cheaper the transportation; take as an example kainit, which contains only one-fourth as much soluble potash per ton as does a ton of sulphate of potash. It costs $60 to transport 500 kilos. of soluble potash in the form of kainit from Germany to the Philippine Islands, but if purchased in the form of sulphate of potash the cost would be only $15. The same would hold true in transporting 500 kilos. of soluble potash from the bodega to the field. It would take just four times as many trips to transfer the 500 kilos. of soluble potash in the form of kainit as it would in the form of sulphate of potash.

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(INCORPORATED.)

The Scientific Officer.

Mr. R. D. Anstead, B. A., returned to head-quarters on Tuesday morning.

The International Rubber Exhibition, 1911.

In a letter dated London, May 19, 1911, Messrs. Rowe, White & Co., state that they have seen Mr. J. A. Richardson and that the arrangements are far advanced. The booklet is in print, although the form which it will definitely take has not yet been passed. As regards finance, they do not think that the £400 already remitted will be much exceeded, but they mention that it is quite impossible to foresee every contingency. A list of the exhibits not having been sent to them, it might be impossible to include the description in the official handbook when the exhibits arrived, but they are to be very clearly identified and marked on the stall.

Mr. Richardson has also written, and in the course of his letter he says that, on his arrival in London about the middle of May, he found that all arrangements had been practically made regarding the South Indian exhibit. The space had been booked, the plan of the stall had been arranged, and the contract had been given out. The booklet was ready for revision, and Mr. Richardson had gone through it and corrected it.

Mr. Richardson adds, "As regards the Southern Indian Committee, we have not had a meeting and I do not think are likely to, unless it comes off during the Exhibition. As I have already pointed out, arrangements were practically complete before my arrival, and the funds at our disposal fully expended." Mr. Richardson had sent a circular letter to members of the Committee pointing that their duties were practically nominal and simply stating that, as the official book was going to press immediately and as he was anxious to have the names of the Committee included in the book, he had put the various names down in anticipation of the approval of those concerned. The members of the Home Committee are as follows :—

J. A. Richardson, (*Chairman*).

G. L. Acworth.	D. G. McFarlane.
H. P. Hodgson.	D. E. Sinclair.
H. M. Knight.	D. McArthur.
Henry Smail.	R. L. Proudlock.
J. C. Sanderson.	R. L. Gudgeon.
C. E. S. Chambers.	J. A. Harris.
H. I. Lindsay.	G. Romilly.
G. Croll.	L. E. Kirwan.

Scientific Officer's Papers.

LXVI.—The Protection of Birds.

Many of the most beautiful birds of the world are threatened with absolute destruction, unless something is done, and done soon, to protect them, owing to the big demand for their feathers. The lyre-bird and plumed egret in Australia, the blue jay and monal pheasant in India, and the humming birds in the West Indies are rapidly becoming extinct owing to the large numbers which are killed every year to satisfy the demands of the feather trade, a trade which is chiefly in the hands of undesirable people, and which is unfortunately fostered by an inexplicable desire on the part of the fair sex to follow the dictates of an insane fashion of adorning themselves with the plumage of beautiful birds.

Apart from the sentimental value of birds, their relation to agriculture is a close one, and all planters and lovers of nature will agree that legislation is necessary to preserve birds from wholesale destruction in India and elsewhere, so that I make no apology for quoting at some length from a lecture on the subject delivered to the Royal Colonial Institute on 20th December 1910 by Mr. James Buckland.

After describing how the plumed egret is destroyed in large numbers during its breeding season, thus leaving hundreds of young birds to die of starvation, and other equally revolting atrocities, Mr. Buckland continued :—

" No branch of a country's natural resources will better repay intelligent conservation than the bird life, on which every human being must depend for agricultural prosperity and sanitary safety. Like a deservedly popular politician, you may say that you are not an agricultural labourer, and consequently are not interested in the preservation of these tireless aids of the farmer. I most emphatically say that you are directly and vitally interested. No matter in what direction your interests may lie you are primarily dependent on the success of the agriculture of our Colonies. Moreover, there never was a time in the story of our Empire when the grim natural law which decrees inexorably that only the fittest shall survive, be it animal or nation, was more alarmingly self-evident than it is at the present day. Let me explain the debt we owe to the birds for the foodstuffs we get from the Colonies, and without which in time of stress we should be lost.

" He who studies the relations which living organisms bear to one another knows that the main effort of each animal or plant is to preserve its own life, to breed, and to multiply. He knows, also, that the similar efforts of other organisms by which it is surrounded tend to hold its increase in check. If any one of these perpetuating forms of life, which we call species, should be left without check it would become so numerous that in time it would devour the food supply of all. Now birds are the natural check on insects. Rapacious birds, again, such as hawks and owls, hold a chief place among the forces which are appointed to keep in check rats, mice, and other small rodents, which breed rapidly and, unless kept in check, are very destructive to grass, fields, crops, and fruit trees. In a word, to keep in check insects and rodents is the function of birds in nature's great plan. More than this, it is a particular office in the economy of nature which they alone are able to perform. Eliminate birds from living organisms and there would be an immediate increase in the number of injurious pests. Swiftly the song of the harvester and of the fruit gatherer would be hushed ; weeds would block up the entrance to ruins.

" In time every tree would be defoliated, all vegetable life destroyed, and without vegetable life animal life would be impossible upon the earth. In eight years probably, certainly not more than ten, this globe would be a desert.

"The value of birds to our Colonies should be patent to all by the way they quell great insect invasions. I have space to give but two instances only of the many I could cite. The locust birds (*Pastor*) of South Africa are so dependent on locusts for food that they usually breed in very large colonies in localities in which the locusts have deposited their eggs. Without these birds, agricultural interests in certain areas of the States which form the Union of South Africa would perish.

"In Australia a veritable plague of grasshoppers periodically visits the paddocks. Were it not for the straw-necked ibis (*Carphibis spinicollis*) and other birds, these moving, devastating armies of atoms, against which any attempts that man could make would be a mockery, would devour every green thing. But the birds gather to the feast, and the plague is stayed. Scientific research has proved that a flock of 200,000 ibises will consume in a single day twenty-five tons of these ravening pests.

"Such instances of the quelling of insect outbreaks are noticeable, but the regulative influence steadily and perennially exerted individually everywhere by birds, which tends to keep thousands of species of injurious insects, to say nothing of rodents and harmful weeds, below the point where their injury to agriculture and forestry becomes apparent, is seldom appreciated. During the season of reproduction millions of birds, all intent on the same business, having young ones at home which must have insect food of some sort, are ceaselessly engaged from dawn to dusk in carrying supplies to the nests. Every tree is hunted over, every vegetable searched, every inch of ground examined, all the air hawked incessantly, to supply that imperative demand. Thus billions of predacious insects in all stages of development are daily passed into the insatiable stomachs of the nestlings.

"Now let me give some little account of the traffic in the feathers and skins of the birds of our Colonies, and let me speak plainly about it. For some time past all detailed advertisements of the London fancy feather sales have been withdrawn, and the publication of the reports of the sales in the official journal has been suppressed. In addition to this, 'Welcome, Stranger!' is not written over the door of the gloomy charnel-house in Houndsditch in which the goods are on view before being sold in Mincing Lane. Nor are the catalogues bestowed on a stranger with that unsuspecting freedom which characterises their distribution at an ordinary sale. Sensible men will understand that there must be a reason for wishing to conduct this business as privately as possible, for the more closely a trade, of whatever description, attempts to guard its operations from the intrusion of the outside world, the more obvious is it that there is something which it wishes to hide from public scrutiny. At first it seems difficult to understand why there should be any mystery about the fancy feather sales. But the position is readily appreciated when it is stated that all our Overseas Dominions have done all that lay in their power to protect their native birds, but that in almost every instance their efforts have been rendered abortive by illicit export. In a word, the London trade in fancy feathers depends largely for its supplies on smuggled goods. Let me illustrate this fact by one example, India. The question of the necessity of prohibiting the export of plumage on account of the harm done to agriculture by the killing of useful birds for their feathers was raised in India as long ago as 1869. Nothing, however, came of the agitation until 1887, when it became only too apparent that legislative action must be taken. But the enactment of 1887 proved wholly inefficacious to cope with the increasing slaughter of plumage birds useful to the cultivator, and in 1903 the Government of India issued a Notification under section 19 of the Sea Customs Act prohibiting the taking by sea or by land out of British India of skins aud feathers of all

birds other than domestic birds, except feathers of the ostrich. Since that Notification was issued, the skins and feathers of India's most useful and most beautiful birds have continued to figure in the catalogues of the London feather sales. It will interest you to know how they are conveyed clandestinely out of India. Fictitious names are used, fictitious addresses given, and the feathers, falsely declared to be cow-hair, horse-hair, or some similar light material. Artful to a degree, the trader often selects devious routes by which to send the contraband goods to London. Penang is a route much favoured by those engaged in this questionable pursuit, though all ports of the Straits Settlements are freely used for the same purpose. The object of this manœuvre is explained by the fact that the Customs are less watchful over the exports to those ports, where there is no market for plumage. Thus the main object of the trader is attained. The goods are got out of India. Once clear of her ports, they can be shipped quite openly to London.

"In passing, I may mention that we find the same sort of thing in Australia, where the feathers of protected Queensland birds, for instance, are often shipped from Adelaide. In Trinidad, again, the customs at Port of Spain are evaded by taking humming-birds in small parcels as luggage to Ciudad Bolivar, on the Orinoco, in Venezuela, and from there shipping them to London. Indeed, there seems no limit to the devices conceived, for certainly nothing can so sharpen human ingenuity as the desire of gain. But to return to India.

"The bolder spirits ship direct to London. I will give you an instance of this. In March, 1908, six cases, described as containing cow-hair, were exported from Calcutta. Subsequently, suspicion was aroused as to the real contents of the cases, and the authorities at Calcutta despatched a warning telegram to the London Custom House. When the cases arrived in the Thames, they were examined with more than usual care. The 'cow-hair' consisted of the skins of 6,400 brilliantly plumaged Indian birds. In the absence of a plumage Bill, such as Lord Avebury so ably piloted through the Lords, nothing could be done, and the cases and their contents were handed over to the consignee. The incident, however, led to the authorities evincing some little curiosity with regard to the contents of other cases of 'cow-hair' which had immediately preceded the one I have mentioned. It was then discovered that between December 20, 1907, and February 15, 1908, no more than eight weeks, twenty-three cases of 'cow-hair' had been imported from India, and that all had contained skins and feathers of Indian birds. You must not suppose that these are isolated cases. The same sort of thing took place yesterday, is taking place to-day, and will go on taking place unless some drastic measure is passed to prevent it, until the traffic in illicit plumes ceases for lack of victims.

"The possibilities of parcel post as a medium for smuggling has not escaped the notice of the feather-trader. But it does not give unalloyed satisfaction. He gets caught too often. Under the Post Office Act the Post Office can deal with any consignments of packages by parcels post more effectively than can the Customs. Besides, the officials at St. Martin's-le-Grand are ferrets. I could tell you of three instances in recent times of parcels from India, described as containing silk, being opened at the London Post Office and found to be packed with plumes of the egret. Needless to say, these parcels were not delivered."

RUDOLPH D. ANSTEAD,
Planting Expert.

(*To be continued.*)

INDIAN TEA ASSOCIATION, CALCUTTA.

Extracts from Abstract of the Proceedings of a Meeting of the General Committee, held at Calcutta on May 23, 1911.

Correspondence with the Indian Tea Association (London).—The Committee considered two letters dated, respectively, 28th April and 5th May 1911 from Sir James Buckingham, C.I.E., Secretary to the Indian Tea Association, London. The principal subjects dealt with in these communications were the following :—

(*a*) *The Scientific Department.*—In the letter dated 5th May Sir James Buckingham stated that, on the recommendation of Mr. H. Maxwell Lefroy, Imperial Entomologist to the Government of India, the Committee had selected Mr. J. W. Challoner for the vacant post of Entomologist to the Association.

(*b*) *Chittagong shipments by the Clan Line.*—In writing to London on the 12th April, the Calcutta Committee referred to the question of whether the Clan Line, Ld., are justified, under their agreement with tea-shippers, in placing on the Chittagong berth, steamers other than their own liners. They suggested that the London Association should upproach the Clan Line, asking for an intimation as to their intentions for the future, regarding the agreement. As the Calcutta Committee understand this document, the Company are not justified in utilising chartered steamers for the service.

Sir James Buckingham stated, in his letter dated 5th May 1911, that this suggestion was approved, and that the Clan Line, Ld., were being addressed in regard to it.

(*c*) *The Budget.*—In the letter dated 5th May 1911, it was stated that on the 1st idem a largely attended meeting of merchants, brokers, and others interested in dutiable goods was held at the London Commercial sale-rooms. The following resolutions, which were proposed by Mr. Martin, (Messrs. Henry Tate & Sons, Ld.), and seconded by Mr. R. Alston, (Messrs Peck Brothers & Winch, Ld.), were carried unanimously :—

"That this meeting, representing merchants, dealers, and other payers of duty on tea, sugar, coffee, dried fruits and tobacco, amounting to a total of upwards of £25,000,000 yearly, protests against the delay, loss and inconvenience experienced from year to year owing to the uncertainty as to the date of the introduction of the Budget, and urges for an immediate pronouncement as to the date on which the financial statement for this year will be made."

"That this meeting respectfully suggests to the Government of the day the great desirability of a mutual arrangement between the Government and the Opposition to fix a definite date before which the Budget should be introduced in each year."

"That copies of these resolutions be sent to the Prime Minister, the Chancellor of the Exchequer, all members of Parliament, the Press, and all Chambers of Commerce throughout the country, and that the Chancellor of the Exchequer be asked to receive a deputation on the subject."

COFFEE.

The London Market.

The Produce Markets' Review, of May 13, 1911 reports:—Last week's deliveries according to the "London Coffee Returns," . . . . . . are encouraging, especially when it is remembered that the Budget is due next Tuesday, and in some quarters a reduction in the duty is expected. In spite of this there has been an increase of 65 tons for home consumption, a most gratifying result if the Board of Trade Returns are examined, for they have shown a continuous decrease this year culminating in one of 149 tons during April and a total of 306 tons for the four months. It is hard to think that this is all due to a decrease in the consumption, and some of it must have been caused by the grocers holding smaller stocks in consequence of the high prices. But as the decrease in deliveries is not confined to this country but has been apparent on the Continent generally, and even in the United States, it is reasonable to conclude that the high prices for Santos have checked consumption, at it may be difficult to get it back after people have taken to Tea or other beverages. The increase in the London export deliveries last week is due to the removal of 75,000 bags of the valorisation Coffee from London to New York. It was pointed out a few weeks ago that when the whole 200,000 bags had been transferred it would leave the stock here dangerously low, especially as a certain amount must be held as cover to the terminal market transactions. Quotations in the latter market have steadily given way, but only to the extent of from 9*d.* to 1*s.* per cwt. There is certainly a growing opinion here that if the next crop is nearly as large as reports indicate prices are not likely to remain firm when the receipts become heavy, as they generally do in June and July. There is still room for a considerable drop in the Brazilian quotations without affecting Costa Rica and other home trade sorts. These have been very firm and even rather dearer this week, and an improvement in the demand could certainly easily bring about an advance of some shillings.

S. Paulo's Next Crop.

The Associacao Commercial of Santos (comprising the commissarios and exporters there) has issued an estimate on the next Sao Paulo crop of 9,500,000 to 9,750,000 bags. This seems to be the first official estimate that this body of coffee merchants has publicly recorded. The idea to be obtained from this impartial association is that the estimate is an average one, as some members call the crop more and some less. But, whichever it is, the coming crops of Rio and Santos together may be as much as 2,000,000 to 3,000,000 bags below the world's requirements of Brazil grades. The crops are being picked later than usual, and nothing more than fair receipts can be expected until the second half of June.

Trade in the Netherlands.

A British consular report on the trade of the consular district of Amsterdam for the year 1910 states:—

Trade in this commodity flourished during 1910. In January good Santos was quoted at 24¼c., from February to August at 25½c., and the year closed at 36¼c. This rise is said to be due to the smaller Brazilian crop and to the Brazilian "valorisation" scheme, by means of which stock was withheld from the market. The Dutch market availed itself of the rise, and large sales took place during the latter half of 1910. The Java crop was again small. The imports of all kinds of coffee into the Netherlands during the past year amounted to 1,441,771 bales, of which 653,844 bales came to Amsterdam. Of the latter quantity, 471,665 bales arrived direct from Santos by the new Dutch line (Koninklyke Hollandsche Lloyd).

RUBBER.

Cultural Directions for Young Para Rubber.

"Extension Work Circular No. 3" by O. W. Barrett, *Superintendent of Experiment Stations*, published in the *Philippine Agricultural Review*, contains the following directions which may interest readers, as showing the methods recommended in one of the Far Eastern producing countries :—

Removal from seed bed.—The plants should be taken up only during the rainy season. Unless the soil has been wet with rain the bed must be watered so that the earth will adhere more or less to the roots.

In most cases it will be necessary to cut or break some of the larger roots in removing the seedlings ; if many roots are lost in this process it will be necessary to remove some or all of the leaves to prevent evaporation of the sap in the stem before new roots are formed.

The amount of balling which should be done will depend on the character of the soil, the age of the roots, the manner of packing, etc. ; generally speaking, the more earth which can be taken up with the plant and packed firmly into a ball around the roots, the less the plant will suffer from the shock.

Whether transported in baskets, tins, or boxes, the seedlings must be protected from drying out and from exposure to the sun.

Seedlings having a height of 1, 2 metres or more should be cut back to about 60 or 80 centimetres a few days before removing them from the nursery. The seedlings may be taken up when they have attained a height of 1 metre, and should never be allowed to reach more than 2 metres before transplanting ; in special cases trees of 2 or 3 metres could be transplanted in favourable weather by cutting back to about one-half their height before transplanting. Care should be taken to prevnt scratching or bruising the bark in handling the seedlings.

Planting.—Setting into the holes should be done after sunset or rainy days.

The location of the plantation should be such that strong winds cannot damage the trees. If there are no adjacent hills or forest trees to break the force of the wind, belts of trees, such as eucalyptus, cocoanut, bonga, or mango, should be planted around and through the plantation, before or at the time of setting out of the Pará trees. Rows of cacahuate *(Gliricidia maculata)* or ipil *(Lucaena glauca)* may be planted—the former by cuttings, the latter by seeds—as temporary protection, or in conjunction with other kinds, like bonga, cocoanut, and eucalyptus.

Sandy soils are dangerous on occount of the quickness with which they become dry ; low wet soils containing stagnant water cannot be used, though some wet lands can be drained sufficiently to become safe. Localities which regularly suffer from droughts of more than a few weeks duration should be avoided unless adequate irrigation can be provided. Both alluvial and mountain soils are suitable provided they are always moist.

Holes.—The holes should be prepared two to four weeks before transplanting. They must be at least 1 metre in diameter ; a depth of 25 to 50 centimetres is recommended. The subsoil, if poor, should be removed to a distance of at least 50 centimetres below the surface of the ground. In filling the holes only "top soil" (to a depth of 10 to 15 centimetres) about the holes may be used ; care mnst be taken to avoid introducing grass roots or weed seeds with this earth. A few days before the

Pará plants are set in, the holes may be filled nearly full to avoid delay and exposure of the seedling at the moment of transplanting.

Any broken or dead roots should be pruned off with shears or a sharp knife just before putting the plant into the hole.

The earth must be firmed in well around the roots so that there shall be no air spaces or lumps to cause trouble later. If the earth is not sufficiently moist the trees should be watered at the time of transplanting and, of course, as often as may be necessary *until they are well established.*

The proper distance between the holes depends upon local conditions and the plans of the planter in regard to secondary crops. If the plantation is on old cleared ground the trees may be set at 5 or 6 metres, whereas, or rich or recently cleared areas 7 to 9 metres would probably prove better, especially if some secondary crop is to be grown during the first few years. There is no serious objection to setting the trees 6 metres providing the weaker trees are removed (tapped to death) as soon as they begin to interfere with the development of the vigorous individuals.

Cultivation.—At no time during the life of the Pará tree may grass of any kind be allowed to grow over the "feeding area" of the roots. The degree of cultivation given to the space between the Pará rows will depend largely upon the local conditions. As soon as convenient all brush, weeds, and grass should be eliminated. The surface of the ground, at least near the Pará trees, should be planted with beans or some kind of leguminous cover crop which will not only keep down the grass and weeds but will keep the area over the roots of the rubber comparatively cool and moist, and at the same time furnish nitrogen to the soil instead of poisoning it with root excretions, as in the case of grass.

Due precautions against fires must be taken.

No secondary crop like camotes, cassava, or bananas should be planted nearer than 2 metres from the Pará ; after the third year from transplanting no secondary crop, except legumes, may be grown in the plantation.

The kinds of legumes recommended for planting as cover crops in the Philippines are: Centrosema bean, Lyon bean, yam bean, velvet bean, sword bean, and any of the native beans ; cowpeas, mani manihan, peanuts, cacahuate, and ipil (*Lucaena glauca*).

The cacahuate, or baloc-balóc, is a shrub or small tree, especially recommended because it may be readily grown from cuttings stuck into the ground; it can be cut back whenever its height exceeds 1·5 or 2 metres, the removed branches helping to increase the humus layer on the ground. The habit of shedding its leaves for a few weeks in the dry season is a disadvantage in using this species: the ipil, or datels, is not deciduous.

If the soil becomes packed, *i.e.*, so wet and clogged that air and water cannot readily circulate through it, it should be forked by the vertical process, *i.e.*, by trusting a strong-tined fork down into the ground to a depth of 10 to 15 centimetres, then, after loosening the tines, the fork is withdrawn without breaking the roots.

The young Pará trees must be protected from the depredations of pigs, deer, etc.; a woven wire fence is unquestionably the best means of protection. A very closely planted row of bonga palms (*Areca catechu*) can be utilised after about their fourth year as a live fence; bamboo strips may be woven into it and tied so that even pigs cannot force an enterance; or maguey may be planted between the bongas very effectively.

If live mulches, or cover crops, are not used about the young rubber trees some kind of straw or leaf mulch should be kept over their roots

except in very rainy weather. The layer of dry grass, rice straw, or similar material should be just thick enough to prevent the growth of weeds without smothering the Pará roots; it should not touch the stem of the tree; it should be turned over occasionally.

All colonies of white ants (*Termes* spp.) in or near the plantation should be destroyed either by poisoning, fumigating, or "puddling."

All decaying wood should be removed from about the roots of the rubber.

Rubber in Peru.

According to a consular report, the average quantity of rubber collected by a rubber collector during one season, on a good estate in Peru, is from 250 to 300 kilos. per season.

The output during the year 1910 has been rather disappointing owing to an exceptionally wet season, and the shortage of labourers on some of the estates caused by the enrolment of the workers as soldiers during the time of political tension between Peru and Ecuador.

EXPORTS OF RUBBER.

	Kilos.
1909	2,421,148
1910	2,294,191

Although shipments show a falling-off in quantity, prices being high in consuming markets during the year, the value of exports is probably more than in the previous year.

The qualities shipped from Iquitos are Peruvian fine, scrappy negro-heads, Peruvian ball, weak fine, Puttumayo tails, and white ball.

Although the exports show a falling-off in weak rubber, this is only in reference to Putumayo tails, this quality being classified improperly in the exports as weak fine. As a matter of fact considerable activity has been shown in working smoked weak fine in the Rivers Huallaga and Alto Maranon, and as labour and living are cheaper in those districts, the output is likely to increase in the future.

With reference to fine, the falling-off in the proportion of scrappy (quoted in last year's reports as "negroes") rather tends to show more careful work on the part of the gatherers.

Peruvian ball quality continues to get scarcer in all the rivers near Iquitos, many workers migrating to the River Madre de Dios and tributaries, where this quality is still plentiful.

In spite of the interest shown in exploiting weak fine, there are considerable tracts of land in the Alto Maranon, where this quality is indigenous, which could be acquired from the Government at small cost. The trees are tapped in the same way as fine, and with proper care should not perish.

In December, 1909f new laws referring to rubber properties were issued from Lima. All lands belonging to the State may be acquired by private individuals in the following way: by purchase or concession.

Payment of 1 sole for every hectare (10,000 square metres) entitles buyer to freehold rights. If, in 10 years after purchase, the land is not cultivated, up to at least one-fifth of its area, a payment of 1c. per hectare annually has to be paid to the State. No buyer can acquire more than 1,000 hectares of agricultural land, or more than 30,000 hectares of rubber land without special order from the Government.

The new laws are too intricate to allow of an explanation being given in this report. There is, however, a distinct advantage in the fact that owners of rubber estates are to-day able to acquire definite title deeds in perpetuity.

SOILS AND FERTILISERS.

The Influence of Bacteria upon Soil Fertility.

In the *Agricultural Journal of India* for April 1911, Mr. C. M. Hutchinson, B.A., Imperial Agricultural Bacteriologist, writes at some length on the above subject. The following extracts (in which certain sections dealing with Laboratory methods and operations are not included) will doubtless interest many readers :—

Previous to the introduction of the science of soil bacteriology the laboratory examination of soils had been mainly directed to the discovery of the causes of their relative fertility by methods depending upon the determination of their chemical and physical constitution. Chemical analysis has told us much as to the plant foods present or wanting in soils, and has suggested the use of artificial and other manures in the field; mechanical analysis has shewn the necessity for taking into consideration the texture of the soil as a prime factor in producing fertility, but neither of these methods can provide full information as to the multitudinous and complex changes going on in the soil, the sum of which results in the production of available plant food. The importance of the biological factor has been more fully realised in recent years, and the object of this paper is to give an outline of the methods which may be adopted for determining the constitution of the soil complex and its relafion to fertility.

The point to be kept in view is not so much the mere making of a biological analysis of a soil as the determination of its response to cultivation, to irrigation or drainage, or to application of manures, whether organic or otherwise, such determination being based upon the following considerations. A normal soil contains bacteria which may be roughly divided into two classes so far as fertility is concerned (1) beneficial, (2) detrimental. Fortunately the beneficial kinds predominate in the large majority of cases, and for our purpose it will be sufficient to indicate the part they play in producing fertility.

The beneficial bacteria may be sub-divided according to their functions in the soil :—

(1) Those which attack organic matter of soil humus and convert its nitrogen into ammonium compounds.

(2) Those which produce nitrites from these ammonium compounds, and those which further oxidize the nitrites to form nitrates.

(3) Those which bring atmospheric nitrogen into combination as organic compounds, thus increasing the supply of this element in the soil.

(4) Those which attack and break down organic matter in the soil but do not necessarily produce ammonium compounds, their action being beneficial as resulting in the disintegration of vegetable tissues which are consequently more readily attacked by ammonifiers.

Now the presence of these various classes of micro-organisms in any sample of soil may be determined by appropriate methods which allow of their separation and identification, and even of calculation of their numbers, so that it might be supposed that by the use of such analytical processes definite information as to the relative fertilities of soils might be obtained so far as their bacterial content was concerned. Now this is unfortunately an impracticable method, not only on account of the extremely tedious and laborious work involved, but also because of the impossibility of integrating the individual results with any probability of arriving at a true statement of their sum. Other simpler and more reliable methods are there-

fore utilised to determine the biologic activity of a soil, and I hope to show not only how this is measured directly, but by what means an estimate may be obtained in the laboratory of the probable value of various agricultural operations when applied to the soils under examination.

As pointed out above, the object to be kept in view is the response of the soil to various agricultural operations, and it would be well to formulate these in conjunction with their effect upon the condition of the soil and the probable modifications in the bacterial content resulting therefrom.

1.—Tillage Resulting in Increased Aeration.

The activity of practically all beneficial bacteria is increased by this means; the breaking down of vegetable tissues such as roots, stubble, green manures ploughed in, and cattle manure is dependent upon sufficient aëration of the soil, and so, to an even more marked extent, is the final process of nitrification.

2.—Irrigation and Drainage.

These two complementary procedures are intended to regulate the water content of the soil, primarily for the supply of moisture to crops, but the maintenance of the optimum amount of water is also vital to the action of beneficial bacteria; shortage of water produces cessation of their activity, and excess, or water-logging, not only has the same result but encourages the action of certain detrimentals, notably those denitrifiers which are responsible for the losses of combined nitrogen which takes place under these conditions; aeration is also dependent upon a proper regulation of the water-supply.

3.—Manuring.

Although all cultivated soils contain bacteria, the number of these which are found varies enormously in accordance with certain factors such as water-supply and temperature, but also in proportion to the amount of organic matter present, so long as this is not in any great excess. The correlation between number of bacteria and percentage of humus is one that necessarily suggests itself, just as it is natural to assume that the most fertile soil is, *caeteris paribus*, that one containing the optimum amount of this constituent. The addition therefore of organic manures to any soil will affect the numbers and activities of the soil organisms in proportion to the resulting approximation to the optimum humus content; that is to say, that we may expect to find not only an increase in the number of bacteria but a proportionate rise in the degree of biologic activity on addition of organic matter such as oil cake or green manure to a soil which previously contained less than the optimum amount. In the present state of our knowledge of the subject we are not able to make any very accurate use of this method of determining the reaction of a soil to such treatment, but further study of the complex factors involved will no doubt increase our knowledge of the relation between humus content and fertility. Such study must include observations not only of the numbers of bacteria associated with varying contents of humus, but of the effects of such variation upon the relative numbers of the different kinds of micro-organisms, and upon the total resulting changes in the condition of the plant food which depend upon their activity. The effect of the addition of vegetable matter to a soil may be considered under three heads:—(1) as directly adding nitrogen in the form of nitrogenous plant tissue; (2) as stimulating the action of nitrifiers; (3) as encouraging the growth of nitrogen-fixing organisms such as Azotobacter, which, if supplied with carbo-hydrates, such as sugars, can take up free atmospheric nitrogen which is thus added to the store of this element in the soil.

Under the first two heads come green manures, roots and stubble and weeds either growing with the crop or ploughed in after fallowing; under the third head we find comparatively few instances in actual practice, and the result of their application is only doubtfully to be assigned to the fixation of atmospheric nitrogen. The use of molasses in Mauritius on sugar-cane soil may no doubt depend for its efficacy upon such action, and it appears probable that certain artificial cultures ostensibly purporting to convey root nodule organisms into the soil mainly affect the nitrogen content of the latter through the agency of nitrogen fixers such as Clostridium, which do not enter into symbiotic relationship with leguminous plants. I do not propose to deal with this aspect of soil fertility, and shall therefore omit any special reference to the reaction of soils to treatment calculated to encourage the growth and activity of Azotobacter or similar nitrogen fixers.

The problems involved in the management of the operation of green manuring resolve themselves into a series of investigatiens as to the effect of this process upon the biologic condition of the soil. The point of growth at which the green crop may be ploughed in with the best results, and whether this should be done directly, or after cutting and drying; the effect of adding lime or gypsum to the soil at the time of ploughing in and of the distribution of the rainfall, all these points are evidently so closely connected with the biological factor as to demand exhaustive biological analysis, which alone can give any satisfactory indication of the best method of dealing with such questions.

Similarly in the case of cattle manure, the information provided by chemical analysis as to the amount of plant food introduced into the soil in this form will give but meagre indications of its real relation to fertility. It is necessary to take into account not only the amount of plant food in the manure and the specific effect of the latter upon tilth, but also the capacity of the soil to deal with it successfully through the agency of bacteria, which depends not only upon the presence of the latter in sufficient numbers but also upon a proper supply of, water and air, secured only by the amenability of the soil itself to tillage. Furthermore, it is of no less importance to consider the effect of the cattle manure as a conveyor of bacteria into the soil, but the complexity of this aspect of its functions as a fertiliser makes it inadvisable to deal further with it at present.

The relationship between bacterial activity and manuring with artificials, such as superphosphate, potash and lime, has not so far been studied very closely, except in the case of nitrification. Here a very intimate relationship has been shewn to exist between the amount of nitrification effected and the presence of lime; and the same has been found to a lesser degree to be the case with phosphates and potash. The action of sulphate of ammonia upon the soil in producing an acid condition of the latter must be taken into account as influencing its bacterial activity, and the effect produced by certain potash manures upon the texture of the soil has similar results. Fallowing and the rotation of crops must also of necessity affect the constitution of the soil complex and depend largely for their effect upon this action.

It will be seen, therefore, that the success of every agricultural operation, designed to increase the fertility of the soil depends very largely upon its effect upon the activities of soil bacteria, although these methods of treatment have been arrived at empirically and without any knowledge of this relationship. The evolution of many other arts requiring the intervention of micro-organisms has depended upon similar empirical methods, such as those which were in use in distilling, brewing, dairying and vinegar making,

until comparatively recent times. The great improvements effected in such industries by scientific study of the organisms involved, gives us good reason to expect that the science of soil bacteriology, at present in its infancy, will in its turn do for agriculture what similar methods of research have done for these other arts. . . . .

Recent work on soil bacteriology at Rothamsted has demonstrated the intimate connection between the presence of ammonifiers and fertility ; it has been shewn that plants can assimilate nitrogen in the form of ammonia without its conversion into nitrates, and it has further been proved that the increase in fertility produced by partial sterilization of a soil is directly connected with the corresponding increase in the number of ammonifiers. Partial sterilization may be effected by a moderate degree of heat—98° C., or by the use of antiseptics such as toluene; the immediate result of such treatment is the destruction of all actively growing (vegetative) micro-organisms, and planting shews a corresponding diminution in the number of colonies, but further plates made after an interval of some days shew by their numerous colonies, that some forms of life have survived the sterilizing treatment and have subsequently multiplied in the soil. This survival is limited to those forms which can produce spores as a method of reproduction, these spores being particularly resistant to the action of heat and antiseptics enabling the organism to withstand high temperatures, as in the case of Bacillus Subtilis, the so-called Hay Bacillus, the spores of which survive boiling in water for as much as an hour without losing their vitality. It has long been known that partial sterilization produces increased fertility, but this has been generally considered to be due to alteration in the chemical content or physical texture of the soil. The Rothamsted experiments give good reason to suppose that such increase is mainly due to the destruction by the heat or antiseptics of all living soil organisms except those existing as spores, thus removing from the soil those protozoa (ciliata and amœbae) which prey upon and keep down the ammonifying bacteria. Upon the removal of the antiseptic, or return of the soil to is normal temperature, the surviving spores germinate, and the bacteria, unchecked by the predatory protozoa, multiply rapidly, giving rise to a corresponding increase in ammonia production and consequent supplies of available nitrogenous plant food. This view has a special interest in India, as it appears to indicate a possible cause for the increased fertility produced by hot weather ploughing. Mr. Howard of Pusa, who uses the term "weathering" for this operation, is of opinion that partial sterilization is effected by the high temperature, about 60° C. to which the surface soil is raised under the hot sun of April, May and June. I have found that this temperature actually produces an alteration in the bacterial content of the soil, and if it penetrated to the lower layers it would no doubt eliminate many of those bacteria which produce unfavourable soil conditions such as result from the elaboration of organic acids, such as butyric acid from humus. The actual results of "weathering," so far as I have been able to ascertain them in the laboratory, are as follows :—

First.—More or less complete desiccation of the soil resulting in the death of most protozoa and many bacteria.

Second.—Complete aeration, producing conditions highly favourable to nitrification and preventing acid fermentation of humus.

The alteration of the physical texture of the soil and all the effects associated with proper tilth do not come within the scope of this paper, but it will be readily realised that they must play an important part in the preparation of the soil for cultivation of crops. Mr. Howard has described

elsewhere the increased fertility due to this method and has emphasized the obvious increase of available nitrogenous food to be inferred from the general appearance of the crops raised on "weathered" soil. Further investigation is being carried out of the causes underlying this result, and it is hoped that some useful information may be obtained by bacteriological analysis.

Certain bacteria develop more rapidly under conditions which prevent free access of oxygen; these are known collectively as anaërobes and include many of those bacteria which are responsible for detrimental reactions in the soil such as dentrification and acid fermentation. Dentrification implies the reversal of the beneficial process of nitrification, the result being the reduction of nitrates to nitrogen gas, which then escapes as such into the air and is lost to the agriculturist. Fortunately it is possible to avoid much of this loss by methods of cultivation which ensure proper aëration of the soil; tillage and draining effect this purpose by increasing the supply of air and limiting that of water. In the laboratory it is possible by artificially reducing the supply of air to a soil plate to measure the resulting increase of the anaërobes present; this may be done by enclosing the cultures in an airtight vessel from which the air or oxygen is then removed, or more simply by covering the surface of the medium with a glass plate. The results of many agricultural operations are modified by the intervention of anaërobes, especially in the case of the conservation of cattle manure, the ploughing in of green manures in wet soil, and wet rice cultivation, and laboratory investigations will, it is hoped, help to elucidate some of the problems connected with these operations in India.

In addition to the loss of nitrogen produced by denitrification, further harmful effects are liable to follow from the prevalence of those conditions which give rise to it. A large number of soil bacteria are capable of acting upon organic matter in such a way as to produce organic acids, notably butyric acid, under such soil conditions as result from inefficient methods of cultivation with imperfect aëration and drainage. This is especially the case when large amounts of organic matter are introduced into the soil as green manures, without being followed by proper tillage and preceded by efficient drainage. Laboratory examination of soil in this condition reveals the cause by discovering the presence of an undue number of such bacteria as are associated with acid fermentation of organic matter. The acidity of the soil resulting from such conditions is most unfavourable for the proper operation of the beneficial micro-organisms described above, and in general terms may be said to reduce the biologic activity of the soil and therewith its fertility.

The London tea trade correspondent of the *Englishman* cabled a few days ago that ten large distributing firms have formed a combine for the purpose of stifling competition in the sale rooms. The combine, it was said, represents a buying power considerably in excess of half the whole market; it will possibly injure producers more than outside buyers.

Colombo tea men discredit this report, and had heard nothing of the alleged combine until the *Englishman's* statement on the subject appeared. The opinion is held in Colombo that the different interests of the leading tea firms in London are too antagonistic to enable such a combine to work successfully.

Fortunately, tea producers are not entirely dependent on the London market. Moreover, should the above report have any foundation in fact, producers are well placed for forming a combination of their own, for defensive purposes.

SELECTED CUTTINGS.

The Degrees of Virulence of Fungus Attacks.

In these days, when almost everyone connected with agriculture has had a considerable, and often unpleasant, experience of the general effects of fungus diseases on crops, it is hardly necessary to point out that some fungi are much more thorough than others in carrying out their work of destruction. It is only requisite to consider for a moment the damage inflicted upon the sugar-cane in the West Indies by the rind fungus during the last decade of the past century, and to contrast it with the comparatively small annual toll exacted by the root fungus of that crop, or by the pod diseases cacao, in order to realize fully how different may be the effects produced. In the first instance, the colonies were threatened with the complete annihilation of their staple industry; while with the other two, though the yield is reduced to a greater or less extent by the parasites, some return may always be expected from the crops.

Since the attacks of endemic fungi, such as those causing pod diseases of cacao, are much less immediate in their economic effect, and consequently of a considerably less alarming nature to the community in general, ample time is afforded to the mycologist in which to perfect his means of combating them, and to the practical agriculturist in which to realize the importance of such means and to apply them to his crops. Moreover, endemic fungi are frequently in their nature more easy of control than the epidemic. The majority of plant diseases are of an endemic nature, and this fact, taken in conjunction with their extended scientific study, has resulted for the greater part in the formation of fairly efficient means for reducing the damage they inflict, and the recognition of the nature and importance of these diseases has called into being a body of men specially trained in the knowledge of this subject.

Now, since common experience has shown in many cases that such trained men are able to give advice which, if followed, will result in the extensive reduction of the losses formerly incurred owing to the attacks of parasites, a natural belief is tending to arise that mycologists can always afford advice of a simple kind for controlling or eradicating all fungus diseases. In reality, this is far from being the case. Much depends on the nature of the host plant, on general external conditions, and on the co-operation of large numbers of persons whose crops are attacked by any given disease. Even then the position may appear hopeless, and may only be saved by the intervention of some unforeseen external circumstance. A good illustration of what is meant is afforded by the outbreak of canker on the chestnut trees of the United States,* which only attracted attention in the year 1904, and has now become a serious epidemic, so far impossible to control.

The disease is due to a wound fungus identified as *Diaporthe parasitica*, Murrill, which lives in the inner bark and cambium of the stem and all woody branches of the chestnut. On limbs with smooth bark, the parasite produces pale brown, sunken patches on the outer bark. These become more or less thickly covered with the yellow orange or reddish brown pustules of the fungus, which break through the lenticels. In a damp atmosphere, the summer form of spore is extruded in a yellow or greenish tendril, which becomes brown as it grows older. The fungus grows so fast that it can completely girdle a branch or small trunk, and thus kill it, in from one to two years. Even large trunks are girdled as a rule in four years.

* A popular account of this disease is given in an article in Munsey's Magazine, for September 1910, by B. Millard.

The native American chestnut (Castanea dentata) is the plant most subject to attack, but the chinquapin (Castanea pumila), found native from New Jersey to Florida, is also affected, while the disease has been found, as well, on the Japanese chestnut (Castanea crenata). Indeed, it is suggested that imported plants of this foreign variety growing at Long Island may well have served as the original source of the disease. This point has not, however, been definitely established.

Instances of a disease which may have been this were noted as early as 1902, but it was not until 1904 that it attracted attention; while it did not receive full investigation by a mycologist until 1905. At that time it had assumed serious proportions, and by 1909 over fifty per cent. of the trees within a radius of twenty-five miles of New York had been completely killed out. In addition to this, the disease had appeared at various points in a number of states, and its rapid spread throughout the whole of the chestnut and chinquapin-growing area of the United States appeared imminent. Another very serious consideration was that all the preventive measures tried within the area of serious infection had failed absolutely to produce any effect, though these had been carried out on a fairly extensive scale by trained men, and though support was given to the work by the United States Department of Agriculture. There was, moreover, no lack of co-operation on the part of individuals, and no want of money. Everything possible was done in many instances, but absolutely no result was achieved. At the present time, practically every tree within the infected area is doomed, while the possibility of the complete destruction of the native American chestnut and of the chinquapin must be faced. It is needless to state that this destruction represents a loss of economic products aggregating in value several hundred million dollars.

Messrs. Metcalf and Collins, (Bulletin No. 141, Part V, Bureau of Plant Industry, United States Department of Agriculture), writing in 1909, took a less gloomy view of the situation. They believed that the spread of the disease could be restricted to the badly infected area, if stringent measures were adopted with this object. These measures included the most careful inspection of all nursery stock, and the passing of very thorough quarantine laws in all districts at that time free from the disease. Furthermore, they stated that the Department of Agriculture was prepared to give all possible assistance, particularly in educating the public to recognize the disease, so that trees recently infected in a previously healthy area could be removed, and diseased parts burned. In such an area, where the sources of reinfection were small, very careful excision of diseased parts might also prove effective. Even then, they advised that constant vigilance would be necessary. Spraying experiments with infected trees were inconclusive. In the badly infected area, the complete destruction of diseased trees was recommended as the only course to be adopted, since the sources of reinfection were so numerous as to preclude the possibility of successful treatment. It was also suggested that, subsequently, replanting with a partially immune variety, such as the Japanese chestnut, or with a cross between this and the native species, might be found possible. . . . .

No disease as destructive as this has ever yet been experienced in the West Indies. The sugar industry was fortunately saved by the discovery of comparatively immune varieties of cane, giving returns as good as, or even better than, the variety destroyed. Nevertheless, the experience of the United States in the instance quoted indicates that an outbreak of disease might occur on any crop, which could not be checked by the most skilful treatment or the most thorough co-operation, and that nothing would remain but to face the consequences and to adopt the cultivation of some different plant.—*The Agricultural News.*

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The Scientific Officer.

It has been arranged that Mr. Anstead will visit the Shevaroys at the end of the current month. Leaving headquarters on the 28th instant, he will arrive at Yercaud on the morning of the 29th. He is expected to deliver a lecture on Coffee and Rubber at the Victoria Rooms in the afternoon of the latter day. If necessary a brief tour will then be arranged; but the time available is very short, as Mr. Anstead has to be in Madras on the 3rd July, to be examined as to his acquaintance with the Kanarese vernacular.

Hybridisation of Coffee.

With a view to the production of a pest and disease resistant hybrid coffee it was suggested that a plantation should be opened on about five acres of land in the Tiger Hill reserved forest about two miles above Benhope and lying between the Ootacamund Ghât Road and the Coonoor River; this plantation to be in charge of Mr F. H. Butcher, Curator Government Botanical Gardens, Ootacamund, and under the direction of Mr. R. D. Anstead, the Scientific Expert appointed to assist the Planting Industry in Southern India.

On the understanding that the U. P. A. S. I. is prepared to bear the entire cost, Government have sanctioned the carrying out of this scheme.

The Indian Tea Association.

The Scientific Department of the Indian Tea Association, Calcutta, is now issuing a quarterly journal, and copies of the first two numbers have been sent to the U. P. A. S. I. They contain a good deal of useful information about Tea, pests, insecticides, &c., and will no doubt be greatly appreciated by planters. Extracts will be published in the *Planters' Chronicle* from time to time.

"Our Friend" in *Tropical Life* for May 1911 is "Mr. Rudolph D. Anstead, B. A., Cantab., Planting Expert and Scientific Officer to the United Planters' Association, Southern India" of whom the London paper gives a likeness together with the following appreciative remarks :—

"Although just off for a two months tour through the rubber districts of Travancore and Cochin, 'Our Friend,' last autumn, was kind enough to supply us with the valuable contributions and comments that are interspersed in our book on cacao and rubber cultivation, which we appreciate all the more since we know how busy Mr. Anstead was in bringing Southern

India up to his ideal as a producing centre. Those of us who regularly subscribe to the *Planters' Chronicle*, the organ of the U. P. Association of Southern India, can easily realize the amount of work 'Our Friend' puts in in the course of twelve months.

" Born in 1876 at Wisbech, Cambridgeshire, (To-day the centre of an interesting experiment in co-operative fruit-production, and distribution) 'Our Friend,' did well both at school and college. Educated at Giggleswick School, Yorkshire, he specialized in science and mathematics, studies which have since proved very useful to him and to those who have had the advantage of his services as a scientific expert. This work, however, did not succeed entirely in monopolizing Mr. Anstead's time and attention : his school career being one of many excellent examples of those who work the hardest, playing the best. The same year (1896) that he graduated at Cambridge (Christ's College) saw 'Our Friend' head of the school and Captain of the Cricket XI. The next year (1897) Mr. Anstead secured the College Prize for Chemistry, and also gained a Scholarship. Two years later (1899) he won an Honours degree in the Natural Science Tripos, taking for his subjects Chemistry, Botany, Physics, and Mineralogy. He spent the chief part of his fourth year at college in reading up chemistry and agriculture. Leaving college he accepted the post of chemist in some seed-crushing mills and cake and fertilizer works, where he remained until 1901, when he came to London, also as chemist, and carried on research work in connection with the Barbados Manjak industry. This was probably the cause of his going out to the West Indies, which he did in November, 1901, on being appointed assistant to the Government Chemist at Barbados (W. I.) and placed in charge of the rum refinery, as well as of the analyses of sugar food and drugs, fertilizers, &c. In 1903, he became assistant chemist to the Imperial Department of Agriculture (W. I.), taking over the sugar-cane experiments, the results of which work were much appreciated. Sea Island cotton having meanwhile been introduced, Mr. Anstead carefully watched its cultivation and preparation as well as the pests, etc., attacking the plants. From Barbados 'Our Friend' passed in 1905 to Grenada, leaving there in 1909 to go to Southern India. In Grenada Mr. Anstead was at the head of the Agricultural Department, and in that capacity organized an experiment station, started lectures, also arranged for and extended the general educational and advisory work of a large tropical agricultural department, in connection with such crops as sugar, cotton, cacao, nutmegs, spices, coffee, timber, rubber, starches, maize, &c. Besides this he carried on the work of entomologist and mycologist, as well as departmental chemist.

"Those who have studied the question of pests are well acquained with Mr. Anstead's reports in the various agricultural journals, especially the *West Indian Bulletin*, *Agricultural News*, *Grenada Bulletin*, and latterly the *Planters' Chronicle*, Bangalore, Southern India.

"At and around Bangalore, 'Our Friend' continues to advance his reputation as planting expert, and scientific officer to the United Planters' Association of Southern India, and his work apparently extends throughout the southern portion of the peninsula. Here he is studying rubber, coffee, tea, cardamoms, and pepper, not only in Travancore but also in Mysore, Wynaad, the Nilgiris, Cochin and Coorg, with his headquarters and laboratory at Bangalore. It is generally agreed that Mr. Anstead is a coming man, who will soon be 'right there' in the front of the tropical planting world."

Scientific Officer's Papers.

LXVI.—The Protection of Birds.

(*Concluded*).

"Though not constitutionally disinclined to combat, it is my belief that in all disputes every effort should be made to reach a settlement by peaceful methods. With this subject in view I wrote to the Secretary of the London Chamber of Commerce asking if the Committee of the Textile Trade Section would meet Lord Avebury and myself with the object of ascertaining if the question of the Importation of Plumage Prohibition Bill might not be capable of receiving some sound solution through some kind of settlement by consent. The answer I received made it abundantly clear that it would be only waste of time to make any further effort to reason calmly with the trade. The trade means very evidently—unless its intention is thwarted by law—to continue dealing in feathers smuggled out of our Colonies so long as there are any left to smuggle. Or, if this is not meant, the words of the letter I received have no meaning at all.

"Nor is this all. The action of the Government of India in showing a prejudice in favour of settling its own concerns for itself is a cause of deep offence to the feather trade. As a basis for any Conference—so ran the letter—the Notification of 1903 must be repealed. As a matter of fact, there is afoot an active agitation to get it repealed. In face of the magnitude of the injury such a step would cause the agricultural interests of India, I shall examine this matter somewhat closely, It is always the aim of the robber-chief to pretend that he takes from the rich to benefit the poor, so we have the feather-dealer weeping like any crocodile at the injustice done the 'poor Indian' by refusing to let him kill the birds—and, of course, sell their skins in the London market—and forcing him to labour with them for the production of food. It is, no doubt, extremely annoying for the feather-dealer to discover that, after he has been allowed to carry on for a number of years a very lucrative business by selling other people's property, these people should elect to make use of that property in their own interests. For that reason he is quite right to object to the Notification. But when he objects on the grounds that the law is an injustice to the "poor Indian," one can only suppose that he speaks with his tongue in his cheek. Any one with a knowledge of the red death-billow which rolled through India prior to the issuing of the Notification of 1903 who would again hand over its birds to the uncontrolled disposition of the feather-dealer must have a peculiarly trustful disposition. If this is known throughout the country, this egregious effort to obtain possession of the birds of India under cover of a solicitude for the 'poor Indian' will die of ridicule.

"Whenever an attempt is made to alter some defect or incongruity of any law of any country the chief impediment to reform is invariably the vested interest. No such considerations can arise, however, in connection with the plea for the preservation of the birds of our Colonies. For instance, we have the Secretary of the Textile Trade Section of the London Chamber of Commerce telling us in the *Times* that its members have no objection to Lord Crewe's Committee taking action with regard to the preservation of the birds of the Colonies, provided the proper claims of the trade are considered. What claims? Has the feather-trader of this country any vested right which entitles him to claim the privilege of selling the plumage of birds that are of the utmost scientific importance and economic value to, and, moreover, are one of the most cherished possessions of, our Colonies? He has not, and, what is more, he has no property right of any description whatever in the birds of the Colonies. The bird being an essential part of

nature's great plan, is the property of the State. From this fundamental conception of the bird's legal status there can be no logical ground for dissent.

In the *Journal of the Bombay Natural History Society*, dated 20th May, Mr. P. T. L. Dodsworth, F. Z. S., has an able article on the 'Protection of Wild Birds in India and Traffic in Plumage' in which he examines "the various measures which have been taken, from time to time, in India for the protection of bird life." He follows the history of such measures from the beginning and shows how by the aid of the Postal Authorities smuggling has been checked.

A new Bill is before the House of Commons in England, and "after a careful review of the whole subject the authorities have taken up the question of the advisability of a general Game Law for the protection of game in India, and this is at present under consideration. The proposed Bill is of a very simple nature, and affords adequate protection to those wild birds and animals which are threatened with extermination. It defines game, and takes power for Local Governments to declare a close time during which it will be unlawful to capture, kill, or deal in any specified kind of game or the plumage of any specified bird. The proposed measure, moreover, provides a general exception in favour of the capture or killing of game in self-defence or in protection of crops, and gives power to the Local Governments to apply its provisions to birds other than certain specified ones."

This is a matter upon which the U. P. A. S. I. might well keep a watchful eye, and I would appeal to the ladies of our planting districts not to wear feathers, the obtaining of which necessitates so much cruelty. Mr. Dodsworth concludes his paper by quoting Mr. Buckland's powerful article in the *Selborne Magazine* for 1910, and making certain suggestions for the consideration of Government as follows :—

"There would doubtless be a marked diminution in cases such as those mentioned above, if, and when, the Bill prohibiting the sale of plumage and skins of certain birds, which is at present before the House of Commons, becomes law. But there seems little hope of stamping out altogether this nefarious traffic, so long as the vicious taste for wearing feathers and skins of birds by the fair sex in their head-gear continues." "Woman," says Mr. Buckland, has come down through the ages as embodied mercy, tenderness and compassion. Sculptors have represented her with the deep, maternal breast against which tearful little children nestle for succour and comfort. Painters have depicted the poor and the oppressed fleeing to her for refuge from cruelty and wrong. Writers have given her the semblance of Venus, the peerless goddess, who, because of her solicitude for the birds, would not permit victims to be offered her or her altars to be stained with blood.

"What a travesty of this, the world's reverent ideal of womanhood, is the befeathered Herodias of modern times! Is there in the wide world a more repugnant anomaly than the spectacle of modern woman—claiming to be more tender than man—transformed, at the beck of fashion, into a creature heedlessly destructive of bird-life, and in practice as blood-thirsty as the most sanguinary beast of prey? It cannot be said in apology for her sin that she errs in ignorance. So much has been written and said about the brutal methods by which her feathers are obtained that the old subterfuges have become too battered to stand. Even those soothing emollients she was wont to apply to her conscience, 'artificial' and 'moulted,' have become too impaired by constant refutations to be of further service. She knows, no one better, that art cannot reproduce a feather, and she would toss her head in high disdain if asked to wear a moulted plume."

"It would be interesting to know how the practice of wearing plumes and feathers for ornamental purposes originally arose, but it is without doubt of very ancient date. It is one of those relics of remote ages—akin to some superstitions in the religions of modern times—which in spite of its disastrous effects, still lingers, and is an outrage on every feeling of humanity. Through countless generations, man has been persistently shaking off all traces of his barbaric ancestors, and when the progress made by him is closely scrutinised, even after this enormous lapse of time, it is surprising to find that faint traces of his ancient customs still adhere to him with a wonderful tenacity. Times are, however, changing; powerful Ornithologists' Unions are at work; and the feeling is growing stronger daily that our feathered friends must be protected at all costs. Nothing short of an international law will, perhaps, ever accomplish this; but it is obvious that Governments can no longer countenance so pernicious a trade, the sole object of which is to minister for a short space of time to female vanity, or gratify the passing freak of a summer fashion at the cost of an enormous sacrifice of life. At the present time feathers, skins and other such like tawdries satisfy the demands of millinery, but when these fail, who would be bold enough to prophesy that insects with bizarre and fantastic shapes, or exotic butterflies with gorgeous colouring will not next be called into requisition to meet the demands of a new fashion? The attention of the Governments of the day will doubtless then be drawn to the preservation of other species by zealous entomologists pressing for legislation in a fresh direction. But to return to the subject. It seems clear from the measures already taken that India is no longer a haunt for dealers in birds' skins and feathers, and it is high time now that they realised their precarious positions. We take this opportunity of suggesting that no heed should be paid to deputations and memorials urging absurd and frivolous objections, such as birds dropping their feathers naturally; or 1¼ millions of people being deprived of their names of livelihood; or the prohibitions not affording the least protection to birds, etc.

"The points which strike us as deserving of further consideration by Governments are—

(i). To prohibit the export of plumage from one Indian port to another.

(ii). To prohibit the possession in India of birds' skins and feathers, except in reasonable quantities for personal use, or for scientific purposes only. This, it is thought, is the only measure which will ever put an end to the illicit trade so far as India is concerned at all events. For as long as there is a demand for feathers and skins, smuggling is bound to continue.

"In conclusion, we venture to express a hope, and we feel confident that all true sportsmen and naturalists in India will join us, that Government will never be induced, even by the doctrine of non-interference with trade, which is the only argument that can reasonably be urged, ever to relax the prohibitions in respect of plumage, etc., now in force. Even the most impartial student of this question could not help but view, with feelings of dismay and apprehension, the consequences of any such relaxations. For the trade which is now practically extinct would spring into renewed activity, and while causing an irreparable injury by bringing about the extermination of a large number of species of birds, would eventually end by killing itself by destroying that on which it subsisted."

RUDOLPH D. ANSTEAD, *Planting Expert.*

CORRESPONDENCE.

Tea Jats and Labour.

June 11, 1911.

The Editor of *The Planters' Chronicle.*

Sir,—As labour is becoming very scarce, it is important, in propagating supplies and any new extension of Tea, to take into consideration the jât that requires the least amount of labour to pluck it. We all know, to our cost, that the common China jâts require extra labour to pluck them owing to the small size of their flushes, but it has not occurred to some Tea planters that there are important differences in this respect amongst the best jâts of Tea bushes. For instance, if we take the jât of Tea which is in favour with many planters at present, namely the Manipuri, it is not generally known that the best varieties of the Manipur jât are the Kookeecherra, the Alyne and the Kalline. Most of us have taken for granted that owing to the thickness of the leaf of the Manipuri, that variety requires as small a labour force to pluck it as does any other variety of Tea. But now it seems that we were mistaken. If we compare the flush shoots of the Kookeecherra with those of the light Assam indigenous jâts, say the famous "Singlo" (taking two leaves and a bud only) we find that one hundred flush shoots of the latter jâts weigh 68·2 grams whilst the weight of the same number of shoots from the Kookeecherra jât is only 44·6 grams, a difference of two-thirds in favour of the Assam jât! This is an immense difference and will tell seriously in the amount of labour required for plucking. The difference will probably be still greater during the wet season of the year. Of course we must take into consideration that while one round of plucking gave from the "Singlo" variety only 188 lbs. of green leaf per acre, the Kookeecherra gave 298 lbs. as the total number of shoots in the latter jât was so much more numerous than the total number of shoots on the formers jât, as when they were counted it was found that the Kookeecherra gave 117,821 shoots per acre in one round of plucking, (the hot weather, when flushes were few) whilst the famous "Singlo" gave 47,702 only.

Thus it is evident that in districts on which the light Assam indigenous flourishes the labour force will be much less than in those districts in which we depend chiefly upon the hardly Manipur jât, that is in high districts, but it is fortunate that it is just in these latter districts that labour is most abundant, but still the difference in the cost of plucking the different varieties will be so great that this matter demands careful consideration.

Yours faithfully,

J. J. McKENZIE.

The Date Palm.

A correspondent has kindly sent in the following extract from a letter he has received :—

"We are importing young date plants from Arabia and forming model date plantations in Multan, Muzaffargarh and Dera Ghazi Khan district. The date palm is grown to a considerable extent already, as well as in some other parts of the Punjab. But the palms growing in these parts are mostly from seeds, and therefore yield fruit of a rather poor quality. The date palms imported by us will yield fruit of a very superior quality compared with those already growing throughout the district. The crop is a very paying one and we are doing our best to foster it."

RUBBER.

Ceara Tapping Results in Hawaii.

On January 23, 1911, there was held in Honolulu, in the rooms of the Chamber of Commerce, the fourth annual meeting of the Hawaiian Rubber Growers' Association. A number of interesting papers were presented dealing with the progress of rubber production in that Territory, the present status of the industry, and the outlook for the future.

After opening remarks by the President, Mr. F. L. Waldron, Mr. W. A. Anderson, manager of the Nahiku Rubber Company, was called upon for an address. His subject was "Results of Tapping," and the *Hawaiian Forester and Agriculturist* gives his address, in part, as follows:—

"We had very little data on the commercial tapping of Ceará trees, because practically no work had been done, and therefore we started more or less independently at the beginning. At present, however, there is quite a good deal of tapping of Ceará trees in South America and South Africa, reports of which are available from time to time, and they are of assistance to us.

"We are now tapping Ceará trees by making a vertical channel up to a height of about five or six feet, the spout being inserted at the bottom. Then on one side we make diagonal cuts about six inches apart, beginning at a point six inches above the spout and leading into the vertical channel. On the other side of the channel similar vertical cuts are made half way between those first made, each cut extending a quarter of the way around the tree. In this manner one-half the circumference of the tree is being tapped. At the next tapping these diagonal cuts, but not the vertical channel, are pared on the lower side, removing a strip of bark about a third of an inch wide. At the third tapping this new cut is pricked along its upper edge, and at the fourth it is pricked along its lower edge; after which it is again pared and pricked in the same manner, so that one paring is followed by two prickings, making one paring in every three tappings.

"This system was evolved after trying paring alone, pricking alone and pricking at the same time. Pricking is more rapid than paring and gives larger returns for a given amount of labour. The paring alone gives a profitable yield. The fewer parings, as compared with the number of prickings, the better, and while the paring alone gives a profitable yield, the pricking done as described gives a better yield. After the outer bark has been removed a new and tough bark soon forms, which makes pricking alone unprofitable in a few weeks after the bark is removed.

For Best Results.

"For best results, tapping should be done during the first few days after the bark is removed, for the reason that otherwise the latex cells appear to dry up with the action of the air and soon wither. If the trees are not tapped during these first few days, they should not be tapped till after several weeks. Hence, before the tree can be thoroughly tapped, the new bark will have reached the stage where pricking cannot well be accomplished. For this reason, removing the bark by paring over a space only wide enough to prick in the next two or three days, proves better than removing all the bark at once and then trying to prick for a long series. Also, by using the paring knife as above described—not going too deep—profitable tapping is made while removing the bark.

"Of course, objections have been made to pricking, but objections have also been made by good authorities to paring, and would be made to any

method of extraction. The only course open to us is to find the method that looks best and, if it has not already been proven objectionable, use it until it is shown to be so. It was thought at one time that pricking was responsible for injury suffered by some of the trees in a series of tappings last year, but later experience has brought the conviction that not the pricking, as pricking, but the removal of bark at that time, was chiefly responsible, aided, no doubt, by the rather severe tapping that closely followed.

"The system outlined here may be rather severe. In a herring-bone with diagonals only six inches apart, the top of one cut extends above the lowest point in the cut above the lowest point in the cut next above it, and for this reason must interfere somewhat with the horizontal movement of materials in the bark. This objection, however, would be stronger in the case of the vertical cuts, and as the flow of materials in the bark is chiefly up and down or diagonally across, it is rather difficult to determine what strength this objection would have. Also, since the paring is to be followed by pricking, the former is not as it otherwise would be, and therefore does not interfere with the circulation as seriously as it might otherwise. The paring alone was expected to get all the latex. These close cuts have been made for several months, but not yet long enough to determine whether they might be injurious. Of course, the chance of injury can be lessened by the avoidance of too frequent tappings.

TAPPING INTERVALS.

"The yield from a given tree appears to increase for the first six to twelve tappings, after which it decreases somewhat till a point is reached where it remains about constant. The word 'tapping' includes the pricking too. Hence, a series of six, nine or twelve tappings may well be followed by a rest. For instance, if the yield diminishes after six tappings, it might be well to rest it. Probably twelve tappings should be made. We have found that a rest of a week is sufficient at some periods. In this way we remove all the bark we can. If we start from the tree, our next two parings will remove that portion, and then the next time we take off some more bark, when pricking comes immediately after the removal of the bark. This pricking takes place as soon as the bark is removed.

"If a third of an inch is removed at each paring, then in three parings, or nine tappings, one inch of bark will have been removed, and there is plenty of authority for advocating a rest at this stage. We have found that a rest of a week or ten days is sufficient, and then we start again and get about the same result. At this rate, also, fifty-four tappings will take off all the bark between adjacent cuts. Therefore, tapping for one week and resting for three weeks would remove all the bark on one side of the tree in about six months, when it must be rested before beginning on the other side.

"The more rubber we get from each tree at each tapping, the more economical the tapping. After the bark on one side of the tree has been removed for tapping, after six months' rest we would go around to the other side of the tree. It has been found by the experiment station reports and observations that if the tapping is carefully done and not too deeply, it will renew in less than a year. It is only in certain points and when the pricking is too deep, that swellings on the wood are caused. If the pricking is carefully done, it does not swell, but the pricking does go in to the most prolific cells, while in order to get in there with the knife we would have to cut deep, because the bark is so thin. Thus far we have not found satisfactory knives.

Alternate Tappings.

" A movemont is on foot, and growing, in the Far East, to limit tapping operations in any one year to a quarter or a third of the tree, instead of to a half, as heretofore, thus giving three years instead of two for the tapping surface to be renewed. This might well be considered by us, in which case, instead of the full herringbone, going half around the tree, the half herringbone, going one third around, might be used. Of course, this system of tapping is not the last word in the tapping of Ceará trees, but in practice it has shown advantages over any of the other methods tried and is the best we have found so far; furthermore, the best returns, in the use of this method, were obtained in the series of experiments carried out by the Board of Agriculture and Forestry and the Experiment Station last year, and these were obtained by making two vertical cuts, two in each place and at each tapping. They were made with knives, and a number of the cuts were too deep; a number of the trees have been thus injured. The chief objection to it in my mind is that it does not admit of a sufficient number of tappings in each year. If we can discover some other method of getting at the same result, I think we will find it better, provided we can secure sufficient labour.

" When the vertical cut is made, there is a tendency in the bark to crack open, that is, the wood part of the bark cracks open, and this is apt to cause an injury that is difficult to heal, and it makes the bark rust. Aside from that, I have not seen any difference in that respect. We did try making vertical cuts on the tree, and found it more difficult to do the tapping in that way without injuring the tree.

Other Tried Methods.

" Other methods that have been tried with Ceará trees are: vertical cuts—paring, spiral cuts, V's, pricking and collecting, pricking and acetic acid, paring and pricking simultaneously.

" The latex cells lie so near the cambium in these trees that it is difficult to cut with a knife deep enough to get all the latex without injuring the cambium. A knife with the right sort of guard will in a measure overcome this difficulty, but no satisfactory knife of this sort has yet been found. The guard should be so constructed as to run in the bottom of the cut and not on the outside of the bark, as is the case with the only locally made knife of this sort that has been produced. Such a guard would not need to be adjustable, as it would always run in the bottom of the old cut, regulating the new cut to the same depth as the old one. Then, due care having been exercised in making the first cut, the others could be regulated by it. In the use of such a knife, by the time it reaches the bottom of the bark, you get the maximum amount of cut, I think that possibly this knife might be adjusted by altering the guard. The guard itself takes up one-sixteenth or one-twentieth of an inch. The Bawmo Northway paring knife has a guard on this principle, but is made for Hevea trees, where the bark is thicker and the parings thinner than with us.

Wanted—A Knife.

" I have no doubt but that a knife suitable to our uses can be produced. I think that perhaps some mechanical inventor here can produce one. We now have coming from the Far East all the knives they have, I mean, one of each of all the knives they have. They stick to the knife with the gouge. They have a bent-in gouge. They have one or two push-and-pull knives. I brought one with me which makes a new cut and the guard runs on the outside of the bark. In order to making a paring of an ordinary cut, we have

to make a "V" cut or else a "U" cut that is very narrow. We are at present using the Yates-Burgus or "Burgus" knife, which, being a push-and-pull knife and making a very clean, sharp cut and both right and left-handed, has shown itself to be a very good all-round knife, after slight alteration to make the cut more nearly "V" shaped in place of the wide "U" cut, which serves on the thicker barked Hevea. This knife has no guard, or gouge, but, since our paring is to be followed by the prickings, we do not try to go very near the cambium, and on trees of proper tapping size, the cut can be rapidly made without injury. Of course, we started paring and pricking at the same time, so that a man could do his paring with that knife and then turn around and do his pricking. If you pull, you can gauge the depth to which you go.

"A very good pulling knife for making first or original cuts in the vertical tapping system has been developed locally along the line of the modified farrier's knife, used in the experiments of last year. A few of these have been made by Mr. Sylvester, and should do good work in making this style of cut. As a rule, the Japanese prefer to draw it, while the Portuguese or Hawaiians will push it. I brought this knife back with me at the same time I brought the gouge that they are using, and we observed both. The knife lies about flat on the cut and makes a clean, sharp cut, while the gouge is a bit beveled and is apt to drag.

"We would be glad if some enterprising person would produce a knife that could be made to produce a cut from four to six inches apart, that could be fairly well controlled as to the depth of the cut and width of the paring made. Such a knife would reduce the cost of paring considerably. It seems to me that we should find someone that could produce a tool with which we can make more than one cut at the same time. If we could secure such a tool—a knife that one man can handle—it would save us a great deal in the cost of paring.

"A pricker perfectly adapted to all the conditions has not yet been found, but, of course, one will be evolved in time. We are at present using a tool designed for an entirely different purpose, but which does very good work, following the paring, in the system now employed.

Coagulation Problems.

"The most interesting problems to be solved in the future of rubber planting, are those in connection with improved methods of coagulating the latex and curing the rubber, and those bearing upon the possible relation of fertilizers to the latex yield.

"Not only have tapping knives been invented and successfully used, that we have never seen and probably have never heard of, but several machines and processes have been invented for smoking either the latex or the rubber. Smoked plantation rubber is quoted at about ten cents per pound higher than the best unsmoked. This additional ten cents per pound may some time mean to us the difference between profits and no profits, and in any case will mean additional income at comparatively little cost. Besides this, the first factory is just being planned, and for this alone two machines which are unquestionably essential have been ordered—a washing machine and drying apparatus. To equip this factory to the very best advantage, it will not be sufficient to have observed one or two successful factories in operation; one should know all the improvements that have been made since these successful factories were erected.

SOILS AND FERTILISERS.

The Study of Humus.

The soil is made up of organic and inorganic or mineral constituents. Except in the case of peat soils and those of like nature the mineral constituents make up by far the greater proportion of the soil mass. Cameron found the average proportion of organic matter in surface soils (to a depth of 8 inches) of the United States to be 2.06 per cent. and in subsoils 0.83 per cent., or 28 tons per acre to a depth of 8 inches and 50 tons to a depth of 2 feet.

Notwithstanding the relatively small percentage of organic matter in ordinary soils, the fertility and productiveness of the soil depends to such a large extent upon its organic constituents that no soil is considered normal without a certain proportion of organic matter. Although this fact is generally recognized, the organic constituents of the soil have not been so thoroughly studied as the inorganic or mineral constituents, and as a result exact knowledge of the nature and function of these constituents is very deficient. Schreiner says: "Every soil investigator, whether it be the chemist, bacteriologist, or physicist studying some special problem, or the agronomist dealing with the general relation of soils to crops, sooner or later encounters difficulties that have their origin in the lack of knowledge of the chemical composition of the organic matter of the soil."

A great deal has been written about the nature and importance of the organic matter of the soil, particularly the so-called humus, and many views have been held as to its relation to crop production, these views changing from time to time, but there has really been very little accurate, undisputed scientific data upon which to base these views. Throughout the century or more of controversy on the subject, however, humus has always been recognized as a most important factor in soil fertility. In fact, the older investigators of the subject were disposed to give an exaggerated importance to humus as a direct and essential element of plant food, measuring the fertility of the soil entirely by the amount of humus present. Until within recent years a modification of Mulder's view, that humus and the larger part of the organic matter of soils is made up of humus acids having the same general properties in different soils, was generally accepted.

More recent investigation, however, has shown that this view is untenable and that humus is a very complex substance made up of a large number of chemical compounds, not necessarily related, derived unchanged from plant or animal remains, or resulting from the breaking down of complex bodies in the plant or animal tissue, or from changes brought about by bacterial activity in the soil. The character of the organic matter of the soil is therefore determined by the nature of the materials added to the soil and the character of decomposition they have undergone.

It is obvious that there can be no clear understanding of the functions of the organic matter of soils without exact knowledge of its composition. Such knowledge is important from the standpoint of the farmer, but much more important from the standpoint of the scientific investigator. On this point Schreiner says: "There can be intelligent chemical treatment of any material only when the chemical nature of the material treated is known. The treatment to which soil organic matter is subjected under cultural methods is in part at least chemical treatment in that such methods induce chemical changes. The operations of irrigation, conserving of moisture by mulches, aeration by cultivation, inoculation with cultures of bacteria, addition of organic and green manures, are all common agricultural

methods used by farmers and they are also operations that influence the chemical changes which soil organic matter undergoes."

The theory that humus is a more or less definite body, representing the valuable portion of the organic matter of the soil, has led to much futile effort on the part of chemists to devise methods of isolating this body from soils and studying its properties with relation to soil fertility. The rather limited results and possibilities of this line of inquiry from a scientific standpoint have been brought out by the work of a long list of investigators, as well as that of the Association of Official Agricultural Chemists, which, after a number of years of comparative tests of various proposed methods for determining humus, voted at its last meeting "that the referee on soils for 1911 be instructed to investigate the subject of a more accurate method for humus determination."

It is evident from an examination of the work referred to, as well as the various discussions of the subject which appear from time to time, that no one knows in a scientific sense what humus is, or is able to draw a clear line of distinction between humus and other organic matter in the soil. It is therefore of fundamental importance to investigate the organic matter of the soil as a whole and to isolate and study the origin and properties of all of the definite organic compounds which it contains.

Greater progress has very recently been made in this important direction than is perhaps generally realised. Within the past year Schreiner and Shorey and their associates of the Bureau of Soils have reported in Bulletin No. 74 the isolation and study of over twenty compounds found in the organic matter of the soil. These compounds belong to eight or more different classes, as paraffin hydrocarbons, acids, alcohols, esters, carbohydrates, hexone bases, pyrimidine derivatives, and purine bases.

While this work shows clearly the complex character of the organic matter of the soil, it also encourages the hope that the exact chemical nature of all of the organic constituents of the soil may ultimately be determined by modern methods of research, thus furnishing a safe basis for further study of the origin and properties of the compounds and their relation to soil fertility and productiveness, which has not heretofore been available. Such exact knowledge will prove of great assistance in the investigation of all soil problems in which the organic matter is the paramount factor.

Of like importance is the work of Jodidi and others, in which known methods of investigation of proteids are being applied in the study of the decomposition products of nitrogenous bodies in the soil. This work promises to show definitely the chemical character of the nitrogenous bodies present in the soil and the processes by which they are formed, thus furnishing an exact basis for studying the relation of these bodies to the nitrogen untrition of plants, a point on which surprisingly little is actually known notwithstanding the fact that great significance has been usually and perhaps rightly attached to humus as a source of nitrogen for plants. The relation of humus to the availability of the mineral plant food of the soil, a subject not now well understood despite the fact that it has received much investigation, can only be fully cleared up when studied in the light of exact knowledge of the compounds involved.

Bacteriological investigation of the soil has brought out very clearly the fact that, aside from its recognized physical effects and function as a source of supply of nitrogen and perhaps other plant food, the organic matter of the soil is a most important factor in soil fertility as a source of food to the micro-organisms, which increase and elaborate food for higher plants. A

knowledge of the exact composition of the organic compounds formed in the soil under different conditions will perhaps make it possible to control in a measure the character of the organic compounds produced and thus the bacterial activity of the soil.

Evidently no work on humus which does not take account of the vere complex and varying character of the group embraced by this term can by expected to give intelligent or final results. Humus is a generic term, as "mineral matter" is. Considered as a substance, we are dealing with something whose character in a given case is quite unknown, and whose response to tests and reactions or whose effect on plant life cannot be foreseen. It is only as these facts are recognized that real progress in this line of study can be looked for.—*Experiment Station Record.*

Recent Investigations on Soil Fertility.

Dr. E. J. Russell writes in *Nature* :—

For some years past the United States Department of Agriculture Bureau of Soils has maintained that infertility might, and not unfrequently does, arise from the presence in the soil of toxic organic substances that have been excreted from the roots of plants. This view has been opposed on two grounds : it is not evident that plants do normally excrete poisnous substances ; and if such substances are present there is no proof that they would act as poisons in the soil, which possesses a remarkable power of withdrawing dissolved substances from solution. Not long ago Schreiner isolated dihydroxystearic acid from a considerable number of unproductive soils, and now, in conjunction with J. J. Skinner, he has examined its behaviour to plants in water cultures. In all cases its effect was toxic, but the toxicity was much reduced when fertilisers were added to the solution, and was at a minimum when the fertilising constituents were present in the ratio most favourable to plant growth. Several incidental questions were also cleared up dealing with water cultures—perhaps the most difficult of all experiments to interpret—and the paper contains a great number of data bearing on the subject. The behaviour of this acid in the soil is not touched upon, and very wisely no attempt is made to argue from a water culture to a soil. It is, however, a distinct step in advance that an acid has been isolated from certain soils and identified, and shown to be poisonous in water culture. The results may well be connected with the known fact that, in absence of lime, soil becomes acid and loses fertility, which can only be restored by addition of lime or chalk.

So great is the part played by bacteria in determining fertility, that a great amount of attention is being paid in most soil laboratories to their various actions. The fixation of nitrogen is of perennial fascination, and is still far from being solved. Certain bacteria, notably azotobacter, can take up gaseous nitrogen and synthesise protein, nuclein, &c., without any materials save only sugar and various mineral salts. The organisms occur in most soils, and it is only necessary to inoculate small quantities of soil into a solution containing the sugar, phosphates, potassium and other salts, but no nitrogen compounds, for development to take place and nitrogen fixation to occur. The chemistry of the process is unknown ; investigation, so far, has been confined almost entirely to morphological work and to the effect of various conditions on the process. Messrs. C. Hoffmann and B. W. Hammer, of the University of Wisconsin Agricultural Experiment Station, have recently (Research Bulletin 12) repeated and extended some of these observations. They find the best sugars are mannite and lactose, but it is not desirable to have too much. Similarly, there is no advantage in having too much calcium carbonate, although some is needed. In one respect these

authors differ from previous investigators; on analysing the dry azotobacter cells they obtained a protein content of 17·75 per cent. only, against 80 per cent. found by Gerlack and Vogel and 70·6 per cent. by Stoklasa. The cause of the difference is not clear, but may perhaps be ascribed to the slime that invariably surrounds the organism without being an integral part of it, and that is only removed with great difficulty.

How far azotobacter is active in the soil is difficult to determine because there is an opposite process, the liberation of gaseous nitrogen from protein, and also, under anaerobic conditions, from nitrates, also brought about by bacteria. But it has been shown by Koch that the addition of sugar to soil some months before the seed was sown led to an increase in crop by increasing nitrogen fixation, although if applied direct to the crop it produced harmful results. These facts are attracting much attention in sugar-producing countries, and it has been shown that waste molasses, which cannot profitably be sold, gives useful increases in crop when applied as manure some weeks before planting, especially on light soils. S. S. Peck, of the Hawaiian Sugar Planters' Experiment Station (Bulletin 34), has studied the two changes, nitrogen fixation and denitrification, and confirms the general results already obtained; molasses applied before planting stimulates nitrogen fixation, but applied to the growing plant it does harm by causing loss of nitrate or diminished nitrification.

He also confirms some recent work of Russell and Hutchinson, and finds that numbers of protozoa harmful to bacteria occur in soil—he found amoebae, paramecium, and others—all of which can be destroyed by moderate heat, or antiseptics like carbon disulphide. Partial sterilization of the soil is being studied in several directions. *The Journal of Agriculture of South Australia* states that farmers there have long recognised the advantage of burning the stubbles, and thus heating the soil; investigations are in hand at the Roseworthy Agricultural College to study the problem from this new point of view. An apparatus for soil sterilization suitable for gardeners is described in *The Journal of the Department of Agriculture of Victoria*, which is similar in principle to some that are working in England. *The Scientific American* recently gave an account of methods proposed in the United States.

Although nitrates are invaluable in the soil, an excess is injurious, because it causes plasmolysis. Dr. Headden, of the Colorado Agricultural College Experiment Station (Bulletins 155 and 160), reports analyses of soils in Colorado containing such excessive amounts of nitrates that they were sterile. He thinks their formation can be explained only as due to bacteria; he supposed that nitrogen fixation has gone on to an excessive degree, and has thus led to disastrous consequences. Further work on these soils will be awaited with interest.

The factors determining soil fertility are slowly being disentangled but they are far from being fully known, and therefore investgations of cases of infertility are of considerable scientific interest, besides being of technical importance. Such a case is afforded by the scouring pastures of Somerset, now being studied by C. T. Gimingham, of the University of Bristol. Pastures in certain districts of the Lower Lias formation cause diarrhoea or "scouring" in cattle fed on them. No obvious explanation is forthcoming, no poisonous weeds are found, nor does the provision of a pure water supply obviate the trouble. Mr. Gimingham has, in *The Journal of the Board of Agriculture* (No. 7), collected the main facts, and adduces strong evidence to show that the physical condition of the soil is the determining factor, the peculiar conditions obtaining on the Lower Lias, but not on the adjacent

alluvium and Inferior Oolite being favourable to the factor actually causing the disease. Experimental work on the subject is necessarily slow and tedious, but, in view of its importance, it is much to be hoped that Mr. Gimingham will be able to continue the work on the sound lines on which he has begun.

The phenomena of flocculation and deflocculation in soils have been much investigated, but are far from being worked out. E. E. Free has recently summarised *(Journal of the Franklin Institute)* the present position of our knowledge, and has shown that a marked influence is exercised by impurities present in the water in which the suspensions are made for experimental purposes. He considers it probable that in absolutely pure water only a medium degree of permanance would be attained. In his view, any material can be suspended in water, flocculated, and deflocculated, if it can be got in a sfficiently fine state.

The Conservation of Soil Wealth.

Reviewing *Soil Fertility and Permanent Agriculture*, by Professor C. G. Hopkins, (London and Boston : Ginn & Co.,) *Nature* writes :—

Professor Cyril Hopkins, of the Illiinois Agricultural Station, is well known in the United States as the initiator of a systematized policy for restoring the fertility of the land of the east and middle west, which is in many respects a supplement to the great work of conserving the national resources that the late President succeeded in bringing home to the American public.

The problem is one quite distinct from the agricultural questions prevailing in Western Europe. Up to the present time almost, it might be said that American Agriculture has been extensive in its character and wasteful in its methods. It has depended entirely upon the natural resources of the soil, and in many districts has only succeeded in exhausting them. In Virginia, in New England, and in many of the older States one may see great areas of indifferent farming and even of derelict land; land which has been cropped without due regard to the future until it has ceased to be profitable with the style of farming there in vogue and is now occupied only by comparatively backward cultivators, who draw but the poorest living from the soil. Even of the rich prairie lands of the middle west, in Illinois, Iowa and Ohio, notwithstanding the enormous stock of plant food present in the soil when it was first taken into cultivation, a similar story is told. The yields on much of the land are declining, and the tendency on the part of the enterprising men to move west to the virgin soil has been very prominent of late in the migration of American farmers into those parts of Western Canada that have lately been opened out.

With certain conspicuous exceptions the American farmer has always been raising a succession of crops which drew upon the resources of the soil ; wheat has been alternated with corn and Timothy hay, and each crop has been either sold away from the farm or consumed in the great barns in which the stock are housed through the severe winters. In many cases the shortage of labour has prevented men even from restoring to the land, the manure made by the stock. while no root crops are grown and no sheep are kept to run over the land and restore to the soil the fertilising ingredients that have been drawn from it by the fodder crops. And though the fertiliser trade in the United States is of enormous dimensions, it is too much confined to a relatively small class of intensive farmers, and does not represent a very large outlay on the total area of land under cuitivation. Thus in many respects the condition of farming has been similar to that prevailing in Europe before the introduction of artificial fertilisers, that is to say, that

the farmer has been dependent upon the resources of the soil alone. In Europe, however, the cultivator has been forced by the lack of further land to a system of conservative farming which would maintain the fertility of the soil and the production of crops, at a somewhat slow level, perhaps, but one that would show no decline for a very long period of time.

In the Norfolk four-course rotation, for example, all that is sold away from the farm is meat and corn ; the straw, the hay, and the roots are more or less completely returned to the soil. The growth of the clover crop once in the rotation was more than capable of replacing the nitrogen sold away and the inevitable wastage. The stock of potash in the soil is so enormous as to be practically inexhaustible, and cultivation will slowly make it available. Only the phosphoric acid suffers a steady and irreplaceable loss under such a conservative system of farming, but this loss is not a very large one. Prof. Hopkins has made it his mission to awaken the Illionois farmer and his neighbours east of the Mississippi to a sense of the inevitable decline of the fertility of their land unless they also work out a similar conservative rotation, and he has shown them how this can most profitably be effected with the fertilising resources now available.

In this system Prof. Hopkins lays less stress upon the nitrogen question than we are accustomed to do in Europe. Even to-day the old prairie lands are still rich in nitrogen, and he considers that the introduction of a vigorous clover or cow pea crop into the rotation will be sufficient to maintain the nitrogen at a profitable level for production. To secure a good clover crop it is necessary that there should be an ample supply of phosphoric acid and potash. Of the latter element the initial stock is large enough to last for many generations ; all that is necessary is to bring it steadily into solution. To this end, and also to ensure the proper bacterial actions which both collect nitrogen and bring the organic nitrogen compunds in the soil into forms assimilable by plants, a neutral reaction is required in the soil, and Prof. Hopkins uses finely ground limestone in preference to the quick-lime which we more commonly employ. Then he turns to the phosphoric acid to complete the chain, and supplies this foundamental element by one of the mineral phosphates so abundant in Carolina or Florida in a finely ground condition preferring the neutral finely ground rock to the artificially prepared acid superphosphates more common in Europe.

Dynamite in Agriculture.

Probably no stranger use for dynamite has ever been devised than its substitution in place of the plough for the tilling of clay land (says the *Pastoralists' Review*). It is being put to such a use on a considerable experimental scale in Kansas. The first experiment at Spartanburg consisted of the exploding of a stick of dynamite in each of a series of water-melon hills, and the resultant crop showed the benefit of the heroic treatment. The next experiment was the breaking-up of an acre field by dynamite. The cartridges were placed 3 ft. apart in rows, and at a depth of 4 ft. The holes were made by driving crowbars to the desired depth. The dynamite was exploded by a line of men, provided with red-hot irons. The line went rapidly down the field, the explosions following the men in a steady roar that was deafening. The explosion threw clouds of soil 30 ft. into the air, and covered the men from head to foot with dust and dirt. Clay land, when once disturbed to a depth of 4 ft. to 5 ft., is said never to revert to its former solid and impervious condition. One of the great troubles of the southern farmer of America has been to keep the clay from puddling and holding the water on the surface of the soil—a trouble thus removed.

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The Annual Meeting, 1911.

It has been decided that the next Annual Meeting of the U. P. A. S. I. shall be opened at Bangalore on August 28th, 1911, and District Planters' Associations have been requested to give notice of any special subjects that they would wish discussed and of any resolution to be brought before the meeting.

The U. P. A. S. I. Exhibition.

A few exhibits have been received by the Secretary. Hon. Secretaries of District Planters' Associations have been asked to try to give an idea of the number of exhibits likely to be sent in from their respective districts. Individual planters would greatly assist if they, also, would kindly notify the Secretary, U. P. A. S. I., if they intend to send in exhibits of any kind. It is requested that detailed information may be given, as far as possible; and that if the exhibits are not to be sent on later to the Mysore Dasarà Industrial and Agricultural Exhibition 1911 (to be held in September) this may be clearly stated. In the absence of specific instructions to the contrary every exhibit will be sent on to Mysore in due course.

The Scientific Officer and the Secretary both wish to make arrangements, if this can possibly be done, for the fitting up of a special "Planters' Pavilion" at the Mysore Exhibition. They would like to plan this so that it may comprise exhibits of staple planting products and even of minor products; of tea, coffee, rubber, &c., in different stages of preparation. For example, tinned coffees and packet teas should be shown, as well as the unroasted berry and the unpacked leaf. It is thought desirable also that a certain supply of tea and coffee (partly in packets and tins) should be available, separately, *for sale*. Also that a refreshment room should be arranged, wherein tea and coffee could be supplied to the public. (If the material were provided by planters it would in all probability be easy to arrange for some well-known caterers to "run" the room.) The main object in view would be an attempt to *popularise* Indian tea, coffee, &c., and though the Mysore Exhibition is not a large one there can be no doubt that a display such as that now contemplated would lead to very wide advertisement of all the staple products of the planting industry of Southern India; for descriptive reports of these annual exhibitions are published in the majority of the newspapers of this country.

The Scientific Officer.

Mr. R. D. Anstead, B.A., will be at Yercaud for two or three days at the close of this month and in Madras about the 4th (and perhaps the 5th) July.

The Labour Committee.

In a letter to the Chairman, Mr. Aylmer Ff. Martin writes:—

"I received the last of the Labour Maps only yesterday.

"I have therefore been able to complete my 'Mamma' Map.

"From this it is possible to judge the position of the various planting districts, and the various localities from which Labour supplies are drawn.

"There are blank spaces quite close to all the planting districts, but these represent mountains and uninhabited areas.

"The following parts of the Tamil Districts of South India do *not* appear to supply any coolies to South Indian planting districts:—

"*Tinnevelly District*, a narrow strip along the East Coast.

"*Ramnad District*, the Eastern half.

"*Madura District*, from a few miles East of Madura town, to the Bay of Bengal.

"*Trichinopoly District*, South-East and North-Eastern parts, comprising about half the Districrt.

"*Tanjore*, practically the whole. Only the small neck running towards Trichinopoly town supplies us with labour.

"*South Arcot*, all those parts ten miles away from the railway.

"*Chingleput*, North of Madras.

"*Vellore*, 10 miles East and South of the Railway.

"*Coimbatore and Salem*, the Northern parts bordering on the Mysore frontier, which is mountainous and sparsely populated.

"This does not mean that no coolies are recruited from the parts I have indicated, on the contrary, all except the mountainous sparsely populated parts of Coimbatore and Salem districts are overrun with recruiters for Ceylon and Malaya. The eastern parts of the districts of Tinnevely, Ramnad, Madura and the whole of Trichnopoly district, were strongholds of Ceylon in the old coffee days of that Island, and still continue to be so.

"In my opinion it would be most unwise to attempt to compete with Ceylon in these and similar places, because it would drive their recruiters to other parts of the same districts on which we ourselves depend and thus enter upon a cut-throat policy which would injure everyone concerned, and do no good to anybody.

"Similarly, Tanjore district and the East Coast of Chingleput is completely overrun by the Straits Settlements and the Federated Malay States.

"The over-sea places I have mentioned overlap our own districts, besides having it all to themselves in these special places. Natal is now a thing of the past, but Burma and Fiji and other parts of the world have to be reckoned with also. We know that the Ceylon depôts at Madras and at Bangalore are the two from which the greatest number of coolies are supplied to that colony.

"South Indian Districts overlap each other four and five-fold in certain places round the towns of Tinnevelly, Madura, Trichinopoly, Erode, and in parts of the districts of Coimbatore and Salem, and have to contend with over-sea places as well.

"There has been a lot of talk about South Indian Planters not competing with each other in such places, and some idea has been given expression to about "Spheres of Influence" in the past, but to my mind this is nonsense so far as old areas are concerned. Will the planter ask himself the question as to what would happen if he gave up a Labour connection and stopped recruiting at any given place? Is he sure those coolies will go to another South Indian district? I don't mind betting they go across the sea. Why? Because there is a depôt man there offering anything from Rs.20 to Rs.50 (and more perhaps) per cooly, his mouth full of promises of a glorious future and so on. Where then is there a chance for the Indian planter in the Tamil speaking districts? If a recruiter started at the town of Mayavaram and worked along the boundary between Trichinopoly and South Arcot, as far as Salem district, and thence along the Western boundary of South Arcot which divides it from Salem district, eventually meeting the Railway at Jalarpet, he would be in a country unknown to South Indian Planters, and where the competition from over-sea is not so fierce as it is in other parts.

"There is a small tract with Arkonam on the North, Villupuram on the South, Chingleput on the East, and Vellore on the West, where, once ten miles away from the Railway, similar conditions prevail.

"*In the Telugu districts*, one South Indian planting district has a footing in the Western corner of Anantapur. Another in the Southern part of Nellore. Of the South Indian planting districts, these two are alone and so far undisturbed. It is an excellent opportunity of trying the "Spheres of Influence" idea. Let every other planter in South India now agree to leave those particular parts, or as much of them as is required by the present occupants, severely alone. They will then have only the over-sea competition to face, and not the competition of their fellows in South India.

"For the others, there remain Bellary (on which however one planting district has a claim on the score of a connection which was tried and failed, but another attempt may fary better) Kadappah, Kurnool, Guntur and Vizagapatam. I have not included Kristna and the Godavari because of the tremendous rice harvests there, and the fact that, when these are attended to, coolies go to Burma for the rice harvest there, returning after each harvest to their native homes. Nor have I mentioned Ganjam, which is an old Assam stronghold and where the Government have latterly prohibited indentured coolies being recruited.

"I leave the Malayalam country of the West Coast, and the Canarese speaking districts to my confreres on the Committee, as my knowledge of them is too limited for me to speak about them. I would however like to point out that the Bombay Presidency and the Nizam's Dominions are much closer to the Mysore Planting Districts than is Kadappah or Nellore from Travancore.

"To sum up, there are no places in South India which are free from the competition of Labour, there are however places in which South Indian planters need not compete with each other, but only with recruiters from countries across the sea and where competition would not necessarily drive these foreign recruiters to cutting into districts already overrun by ourselves.

"I am forwarding a copy of this letter with the Map to Mr. A. H. Mead, who will send you what he has to say, and pass it on to the next Member of the Committee."

Scientific Officer's Papers.

LXVII.—Report on a Tour in North Mysore.

Leaving Bangalore on 22nd May, I made a short tour in the Bababudin Hills and on the 28th left for the Kalasa district, where I spent a week in visiting various estates, and returned to head-quarters on 6th June. Both these districts were visited for the first time, and though perhaps at an unfortunate time of year, still I had an opportunity of meeting a number of planters whose acquaintance I had not before had the pleasure of making, and seeing the remains of the 'Chick' coffee in the Bababudins, now unfortunately suffering from old age more than anything else.

When a coffee tree is sixty years old it is not to be wondered at that it gets sickly and dies. Such trees are killed, as a rule, by a combination of things. Most of them will be found to be bored in all directions, and though the majority of the wounds are old, still the damaged wood contaminates the sap and tends to produce unhealthy conditions. Added to this there are usually old pruning wounds which have rotted back, and often Stump rot has attacked the roots. A tree which has lost vitality from old age naturally succumbs to such a combination of ills where a vigorous young tree is able to withstand them.

I was glad to find that on some estates a system of tarring the cuts made when trees are collar pruned, or topped, and all cuts exposing a large surface of wood, had been adopted. This practice will undoubtedly add to the life of a tree. The untarred wound rots before the bark can grow over it, and in consequence never heals, and the sap is constantly being permeated by decomposition products, and a kind of 'blood poisoning' is produced.

During the coming season I should like to see some experiments tried in the Black Rot areas. These areas are usually limited in extent, and in view of what Mr. T. Brown has to say about the cost of spraying small areas (see *P.C.*, Vol. VI, p. 299) I would suggest that spraying the trees just before the monsoon might be given at any rate a trial. The spray can be made to stick by adding a gallon of 'Coleman's mixture' to every 24 gallons of Bordeaux Mixture. This is made by mixing 2 lbs. of Resin with 1 lb. of washing soda and dissolving the mixture in 1 gallon of water and heating it for about an hour till the whole mass becomes quite clear. Another method which should be tried is to paint this mixture made to the consistency of paint on to the stems and primaries with a brush, in a similar manner to that adopted to prevent the attack of Rubber trees by Pink Disease. The trees to be treated should be centred and pruned and the stems scraped just before the application. Whitewashing might also be tried instead of Bordeaux Mixture.

Black Rot is always worst where the mist hangs during the monsoon, and where, owing to the lie of the land, excessive moisture obtains. Consequently anything that can be done to reduce this excess of moisture, which facilitates the growth of the fungus, will reduce the virulence of the attack. Such places should be well drained along the contours and if possible the shade should be cut and lightened so as to create a draught of air to carry off the mist. In many places, of course, this cannot be done and direct attempts should be made to check the disease by the application of fungicides. I am firmly of the opinion that it would be worth while to conduct some carefully organised experiments in this direction, and this is one of the many instances where a local Assistant Scientific Officer would be of value. It is impossible for me, under present conditions, to spare the time to supervise experiments, and the individual planter often has neither time nor the

scientific training necessary to do so. An Assistant would give his personal attention to such matters and carefully watch the results obtained in the field, and in all probability would be able to suggest a modification of the plan which would deal successfully and economically with a disease which at present, from all accounts, causes no inconsiderable loss of crop each year. I have little doubt but that were it closely studied in the field by a scientifically trained man some comparatively cheap and easy method could be devised to prevent, or at any rate largely check, this disease just as other plant diseases all over the world have been kept in check by the aid of scientific research. Until, however, we have Assistants, and an Agricultural Department in connection with the U.P.A.S.I. consisting of more than one man, little can be done, and we are dependent upon the somewhat haphazard and unorganised attempts of single individuals, which results in slow progress, and often in a great waste of time, money, and labour.

The same thing applies to other diseases of coffee; they need careful study in the field, and more time than I can at present devote to them. The dreaded 'Green Bug' (*Lecanium viride*) has not yet reached the North Mysore district, and I trust that it will never do so. Constant care should be taken, however, not to introduce it by importing seed or plants of *any kind* from districts known to be infected, and a constant watch kept for its first appearance. The two scales which are most prevalent in the district, as far as I could see, are the Green Mealy Scale (*Pulvinaria psidii*), which occurs as a rule on the shade trees and is apt to spread to the coffee beneath them, and the Brown Bug (*Lecanium hemisphaericum*). The latter may become a bad pest, and I saw one or two places where it was doing a considerable amount of damage, and warranted spraying.

Stump Rot is prevalent and should be dealt with, but it is unnecessary for me to repeat here what I have already said on many occasions about this disease.

While I was in the district manure was being applied to the Coffee on many estates. Here again systematic experiments are badly needed to determine the best manure for coffee in the different districts, the most economical amounts to give, and the right time of year to apply them. Such experiments should be carefully organised and supervised and the results constantly watched by a scientifically trained man on the spot. In my opinion it is only thus that we shall arrive at any definite results with regard to coffee.

I would plead for a more systematic method of manuring; estates should be manured on a regular system extending over a number of years so that the manures applied follow one another in a definite order, and one year's manuring have a definite relation to that of the following year. When asked why a certain manure is being applied to a certain field a planter seldom gives what I consider should be the correct answer, namely, because such and such a manure was applied last year, and such and such an one is to be applied next year. Estates should be divided into six or seven equal divisions and a system decided upon and carried out over a period of six or seven years, so that each division receives its right manure in turn, and in any such system Lime should find a place, and should be followed up the next year with bulk manure, like compost, cattle manure, fish or poonac. Lime backed up by bulk reduces leaf disease to a minimum. I should like to see Nitrolim given a place in the system. It is an alkaline nitrogenous manure which should prove of special value in our lime-deficient soils.

During my tour I saw a good deal of Cattle manure obtained from village pits, bratties, and mixed Sheep and Goat manure obtained from the villages, being applied, either by themselves, or mixed with poonac and bones. Cattle manure is most valuable when it is properly conserved, but such materials have been leached by the sun and the rain until their value is, as a rule, very small, and in all probability the money spent on them could be used to greater advantage in buying poonac or fish. In order to investigate this point, Mr. Courpalais very kindly sent me some samples and gave me information as to prices, &c. I find the percentage composition of these manures to be that shown in the table below.

	Cattle manure from village pits.	Bratties.	Mixed sheep and goat manure from villages.
Moisture ...	11·84	11·28	9·40
Organic matter ...	60·58	65·90	47·43
Insoluble matter ...	19·04	16·18	27·16
Nitrogen ...	0·84	0.28	1·25
	Rs. a. p.	*Rs. a. p.*	*Rs. a. p.*
Cost per ton on estate ...	7 6 2	7 6 2	8 1 10
Value per unit of Nitrogen ...	8 12 9	27 10 10	6 7 2

It will be noticed in the first place that all contain a large percentage of insoluble and useless matter, which consists of earth and sand. In the case of the sheep manure this admixture was larger than appears in the table above, for a lot of stones were picked out before a sample was taken for analysis.

Of course, the organic matter is, as such, of some value as a humus producer, but the real value of such manures depends upon their Nitrogen content. It is difficult to fix an exact monetary value for any manure as so many factors influence its value, and some method of comparison is therefore necessary. For this purpose it is customary to use what are known as unit values. These are the cost price of one per cent. of the various fertilising constituents. Thus the price per unit of Nitrogen is obtained by dividing the price of the fertiliser per ton by the figure representing the percentage of Nitrogen. White Castor Poonac costs Rs.77 per ton and contains 6% of Nitrogen, giving a unit value of Rs.12-13-4; Black Castor Poonac costs Rs.60 per ton and contains 5% of Nitrogen, giving a unit value of Rs.12; Hoongay Poonac costs Rs.46 per ton and contains 4% of Nitrogen, giving a unit value of Rs.11-8-0.

Now compare these with the locally obtained fertilisers. Village Cattle manure and Bratties cost Rs.7-6-2 per ton and have a Nitrogen unit value of Rs.8-12-9 and Rs.27-10-10 respectively. The Sheep manure costs Rs.8-1-10 per ton and has a unit value of Rs.6-7-2. Consequently, Bratties are an expensive manure as compared with Poonac, while the other two have a smaller unit value than, and thus are cheaper than, Poonac. When the cost of application is taken into account, however, this is seen not to be the case. All contain such a small amount of Nitrogen that large quantities must be applied to give each tree the same dose of Nitrogen as would be supplied by a small application of Poonac. A ton of Poonac, containing 6% of Nitrogen, is equivalent in this constituent to 7 tons of village Cattle

manure, 21·4 tons of Bratties, and 4·8 tons of Sheep manure. Mr. Courpalais informs me that, "the cost of application of these local fertilisers is three times as much as that of a mixture of Bone and Poonac." Thus it appears that, at any rate, village Cattle manure and Bratties are not economical manures, and the money spent on them would be better invested in Poonac, while in the case of village Sheep manure it is only economical if of a good grade. As pointed out above, this particular sample appears in the analyses better than it really is because a good many stones were picked out of it before it was analysed.

The way in which to use these locally obtained manures is to make a compost of them with pulp, line and yard sweepings, &c., as described in *P.C.*, Vol. VI, p. 90. Such composts are being made in several places and I hope towards the end of the year to be able to publish some analyses of the manure made in them.

In conclusion I wish to record my thanks to the Hon. Secretaries of the North Mysore Planters' Association and the newly formed Bababudin Planters' Association respectively for the excellent arrangements made for my tour, and also to the planters of the districts for their hospitality and kindness.

RUDOLPH D. ANSTEAD, *Planting Expert.*

CINCHONA BARK AT AMSTERDAM, 1910.

Notwithstanding the large supply of this commodity, practically the whole of the imports have been sold, says a British Consular Report. The total imports during 1910 amounted to 7,059 bales from Government plantations and 96,284 bales from private plantations. The sales, private and by auction, were as follows :—

	Cinchona Bark. Kilos.	Containing Sulphate of Quinine. Koilos.
1908	7,580,172	447,200
1909	8,134,093	494,958
1910	8,573,912	516,639

Of the bark sold by auction, 6,852,743 kilos. were manufacturers' bark, containing 433,913 kilos. of sulphate of quinine, and 1,010,151 kilos. were pharmaceutical bark, containing 35,259 kilos. of sulphate of quinine. The various kinds of bark imported were as follows :—

	Government Plantations. Kilos.	Private Plantations. Kilos.
Ledgeriana	293,040	5,039,985
Hybrids	2,269	1,516,155
Succirubra	129,888	851,446
Officinalis	8,803	...
Robusta	15,562	2,610
Pitayensis	768	...
Schuhkrafft	3,174	...
Calisaya	194	...
Total ...	453,698*	7,410,196†

* Containing 25,828 kilos. of sulphate of quinine.

† ,, 443,344 ,, ,, ,, ,,

DISTRICT PLANTERS' ASSOCIATIONS.

Wynaad Planters' Association.

Proceedings of a Meeting held at Meppadi Club, June 14th, 1911.

PRESENT :—Messrs. Atzenwiler, Bownass, Ewart, Howland, Parker, Powell, Stewart and C. E. Abbott, Honorary Secretary. Mr. J. Carson Parker in the Chair.

1674. *The Proceedings of the last Meeting* were confirmed.

1675. *Election of New Members.*—The following gentlemen were elected as members, proposed by Mr. Parker, seconded by Mr. Abbott :—Mr. G. C. Parker, Mr. W. E. Bownass, Mr. J. C. Stewart, Mr. A. E. Vernede.

1676. *U. P. A. S. I. Affairs.* (a) *The late Mr. Tipping*—The Chairman expressed the great regret with which everyone who knew Mr. Tipping had heard of his unexpected death ; and said that his loss would be felt not only by his personal friends but by planters throughout South India. He proposed that the Honorary Secretary be instructed to write to Mrs. Tipping and assure her of the sympathy of the members of this Association. —*Carried.*

1677. (b) *Date of Annual General Meeting.*—This will open on August 28th. Mr. Abbott was elected delegate.

1678. (c) *Thefts of Produce.*—With reference to the U. P. A. S. I. circular 14 of 1911 (see para. 1671 Wynaad P. A. Proceedings) Government has refused to legislate.

1679. (d) *Accounts.*—The Honorary Secretary informed the Meeting that he had paid Rs.250 for the Scientific Officer's Laboratory, and the balance of the Association's subscription 1910-1911 to the U. P. A. S. I.

1680. *Mr. Wickham.*—Read letter from Ceylon Planters' Association to Secretary, U. P. A. S. I., regarding proposed testimonial. Subscriptions should be sent to the Secretary, Ceylon Planters' Association, London.

1681. *Scientific Officer Fund.*—Read the circular from Secretary U. P. A. S. I. and the late Mr. Tipping's Memorandum. The consideration of the question of raising an 8 annas per acre cess as first formulated by the North Mysore Association was postponed from the November Meeting (See para. 1635 Wynaad P. A. Proceedings) to allow absent Proprietors to be consulted. The Honorary Secretary now stated that he had written to, or personally interviewed the representatives of 10,850 acres of cultivation among members of this Association. He had received replies from representatives of 9,443 acres. All are against the proposed cess, but agree that Mr. Ormerod ought to receive compensation for the greatly increased work that he has had in connection with the Scientific Department since it was established. One gentleman has offered to subscribe Rs.300 annually for investigating the Pepper Vine disease if others interested in that industry will join him.

1682. *Tea Cess Committee.*—Read correspondence ending with Honorary Secretary's letter proposing Mr. J. Carson Parker as representative of the United Planters' Association on the Tea Cess Committee, and recording tbe Wynaad vote in his favour. *Approved.*

1683. *Town Nuisance Act.*—Proposed by Mr. Parker, seconded by Mr. Atzenwiler, that the Deputy Collector be asked to have this Act applied to Meppadi. *Carried.*

1684. *Blister Blight in Tea.*—Read letter from Mr. Anstead calling attention to the danger of using Northern Indian Tea Seed which is likely

to carry this disease. The seed should be thoroughly disinfected, and all packing materials should be burnt. (*Planters' Chronicle*, p. 298).

1685. *Non-Service of Warrants under Act I of* 1903.—Read letter from Mr. West and correspondence with the Vayitri Magistrate on this subject. The Honorary Secretary stated that he had seen the Vayitri Magistrate about this case. Resolved, that the Honorary Secretary address the Collector of Malabar on the subject of the neglect of the Police to execute warrants issued under the Act; and inform Mr. West.

1686. *Liquor Shops near Estates.*—Mr. Atzenwiler complained that a liquor shop had been moved from its former site to one close to his cultivation and that this caused much inconvenience. Read Honorary Secretary's letter to the Collector of Malabar, and his reply stating he is inquiring into the matter.

1687. *Government Inquiry into Increase in Prices.*—Read correspondence with Collector of Malabar. The Honorary Secretary stated that he had sent the information asked for as to the wages current in Wynaad for a series of years; but that he thought it would be impossible to furnish details of the cost of various works on estates, the quantity of the crops gathered, and their value for the last 21 years. The Meeting agreed with the Honorary Secretary's letter. Members regretted that for various reasons—partly change of ownership—it seems impossible to get the information.

1688. *Mr. Martin's Labour Recruiting Map* was examined with much interest.

A vote of thanks to the Chair terminated the Proceedings.

(Signed) J. CARSON PARKER,
Chairman.

(„) C. E. ABBOTT,
Honorary Secretary.

The export of coffee from Porto Rico in 1910 exceeded that of any previous year in quantity. The yield was 45,209,793 lbs. and was valued at £1,181,167.

ROTTERDAM MARKET.

The total import of Coffee into Rotterdam during 1910 was 1,445,200 bags compared to 1,774,300 bags in 1909. Good ordinary Java fetched from 40 to 44½c. per ½ kilo. (from £3 6*s*. to £3 15*s*. 4*d*. per cwt.) and Santos from 25 to 36c. (£2 2*s*. 4*d*. to £3 1*s*. per cwt.)

The importation of Tea was placed at 494,500 packages compared to 482,300 packages in 1909. The price of good ordinary China throughout the year was about 54c. per ½ kilo. duty paid (about 8*d*.) and Java kinds ranged from 37 to 41c. (7½*d*. to 8*d*. in bond).

JAVA TEA IN AMSTERDAM.

The prices of this article varied but little during 1910, and the market was generally firm. Until October prices averaged 39 to 40 c. per ½ kilo., but rose to 44c., in November. The average price during the whole year was 40c., as compared with 38c., in 1909, 37c., in 1908 and 41c. in 1907; 745 half-cases and 200 sixteenth-cases of tea were imported into Amsterdam from China during 1910. Auctions during the year 1911 were fixed to be held at Amsterdam on March 23, April 13, May 11, June 1 and 22, July 27, September 1 and 21, October 12, November 2 and 23, and December 14.

CORRESPONDENCE.

Castilloa Rubber.

19-6-11.

Dear Sir,—I am interested in Castilloa Rubber in so far that I have a few thousand plants. I have been able to find out very little as to results. A friend in England has sent me discouraging accounts from the Report of "Indian Peninsular Rubber & Tea Co.," yet no actual results.

Can any planter oblige with *actual results* from Castilloa of any age? and at what elevation?

CASTILLOA.

[A correspondent expresses the opinion that *if the Editor is prepared to publish letters from planters*, such letters would increase the *interest* of the *Planters' Chronicle.*

This comes from one of the more recent readers of the paper, not from a planter who has received it from the commencement.

Obviously, it is desirable that the Editor should once more express his desire for correspondence and contributions from planters. Not only would these help to make the paper more interesting but they would, he is certain, materially enhance its usefulness and that is an even more important consideration than its interest. The "Planters' Papers" section is not yet sufficiently advanced from the "Mother Hubbard's cupboard" stage. The Correspondence section is greatly in need of a liberal application of "fertilisers." The Scientific Officer joins the Editor in calling for More. Are both to receive treatment like that which was once the return for Oliver Twist's termerity when he asked for More; or are they to be afforded an opportunity to welcome a staunch band of friends and helpers?]

CHINA TEA IN ENGLAND.

The time has come, observes the *Grocer*, when the China tea season just ending might with advantage be reviewed in order to see if past experience will offer any guide as to the action to be taken in the new season 1911-12, which is just now commencing in Hankow, and possibly Foochow. Last season started under a cloud, and it has never really emerged from it. The infusion of the teas was dark compared with the previous season, and the trade condemned them at once. The liquor was coloury, but dull, and it has been difficult to find any distinctive point of flavour in one tea compared with another; consequently the trade have just bought from hand to mouth all through the season. Keemuns under 1*s*., of which the market had been bare for several months, and which were readily bought up for Germany and America when they were offered, led one to expect a rush for the new teas. However, "give a dog a bad name" and you may hang him.

Some of the best Keemuns were taken at very long prices, but all the lower grades up to 1*s*. 2*d*. have been quite neglected by the trade, and had it not been for Russia buying some 10,000 half-chests in the spring of this year, one cannot imagine what would have become of this large stock of all one class of tea. What the trade have used in the place of these teas has puzzled many, but we believe they have used the good Ningchows and Oanfaas, of which there has been a large and good crop, between 7*d*. and 10½*d*. per lb. Another surprise this season has been the good demand from the home trade for Panyongs and Ching Wos, whereas last season the medium grades between 6*d*. and 9*d*. were almost unsaleable.

COFFEE.

The Coffee Trade: Suggested Campaign.

A correspondent of the *Grocer* writes as follows :—

The consumption of coffee in the United Kingdom is so poor as almost to be contemptible ; within the British Isles it is three-quarters of a pound, or less, per head per annum, whereas our neighbours, the Dutch, can make use of 14 lbs. per head each year, whilst of other European peoples the average annual consumption far exceeds proportionately that of ourselves. The purpose of the writer is to suggest that the trade, and, indeed, all who, are interested in the growth, transport, marketing, and distributing of coffee should no longer take this state of things "lying down." Here is a field in which a live and aggressive policy, well backed, carefully planned, wisely and liberally directed, and carried out persistently in every part of the country, can be, and should be, of inestimable use to each and all of the interests involved. It is well known that the world's production has been of late exceeding the world's consumption. The recent

ATTEMPTS TO FOSTER THE CONSUMPTION

of the coffee produce of a certain area is proof enough of this, and, indeed is entirely praiseworthy. If but a single quarter of a pound per head per annum were added to the present amount used the sale would jump up 33 per cent., and there would be a corresponding increase in the quantity imported and sold. Thus the growers would find an outlet for their produce which would pay them a big return. Like advantages would accrue to those who transport the coffee to these shores. Of course, those who market the article, the brokers and wholesalers, are also deeply concerned. An increase in consumption at all appreciable would mean much to them, especially as in the case of the broker or the coffee merchant it is the staple or the only article of their trade. But to all these the fact should be patent that only effort of an aggressive, educative and persistent character can hope to do any good. They should be up and doing, sink their differences, if any, in the common cause of coffee, and take some united action with united resources to put the campaign into operation. Then there is the grocer's part to be considered as the natural distributor of coffee. It is emphatically to his interest that something should be done for coffee, and that he should take his part in doing that something. He owes it to himself to make reparation for his ill-treatment and past

NEGLECT OF A PROFITABLE LINE.

Whilst during the past seventy-five years he has given plenty of attention to tea, he has scandalously misused coffee. Tea he could not adulterate or sophisticate ; not so coffee. That maleficent herb, chicory, was first used for the purpose. Then it was allowed under inadequate safeguards by a supine and careless Government, and finally it became the exception rather than the rule to sell pure coffee. The so-called French coffee in tins then came in, often consisting of 75 per cent. of chicory ; and the degradation of the trade was complete. No wonder the said trade was almost killed! Not even so delightful and charming an article as coffee could stand such abuse. Even where coffee was sold, in most instances it was kept too long in the roasted state (the roasting not having been done on the premises, but at a distance) ; improperly stored ; perhaps ground days before it was sent out ; and thus finally delivered to the customer with all the delicate aroma dissipated and lost—coffee only in name. But the grocer of to-day will see in the rehabilitation of coffee a powerful weapon with which to fight his opponents and competitors. Tea has been exploited by all sorts of proper, and often improper, means, until

every grocer will say with a sigh, "Ah! the tea trade is not what it was!" Indeed, he sees in tea the principal strength of the many-shop companies which are making it so hard for him to "keep his end up." Not so coffee. Coffee has not been exploited by this store or that combine. It offers a virgin field for the activities of all the combined interests enumerated above; and the genuine retail grocer, as the last stage of the journey before coffee reaches the consumer, should have his share equally or proportionately with the other interests in the work of fostering its sale. There is money in it. There is strength in it. There is even salvation to many a dwindling trade in it. Only it must be handled intelligently and in the right way. But how can

ALL THE INTERESTS COMBINE TO "WORK" COFFEE

for all it is worth? I suggest that they should unite in a "Coffee League." This league would be made up of growers, transporters, brokers, merchants, retailers, and even of those who make the machinery and apparatus necessary for the preparation of coffee for the market. The Governments of the countries or Colonies wherein coffee is grown should also be represented in the league, which should have a supreme council chosen to represent all the interests involved. Of course, the league would stand in need of funds, and each interest would be expected to contribute to the common chest and thus find the sinews of war. Its objects would be to educate the public taste for coffee, to enlighten the public upon the advantages and pleasures of its use, and this by means of advertising coffee, by the distribution of pamphlets and samples, and of directions for the making of coffee; by public lectures exhibitions and demonstrations of coffee, machinery and utensils and their use; by articles and notices in the Press, and by other means as opportunity suggested or occasion served. Side by side with this propaganda work among the consumers would go on directive and educative work among the grocers. Thus the Coffee League would have a staff of lecturers and demonstrators who could teach the grocer and his men

HOW TO HANDLE COFFEE PROPERLY,

how to roast and pack the same, how to advertise it and bring it to the notice of his customers. The league might also assist grocers to instal coffee-roasting machinery by grants for the purpose, or loans, as the case might be. Further demonstrations might be given in the grocers' shops, whereat nicely made cups of the beverage could be given to the customers whilst the attendant "talked coffee" and induced them to give the article a trial. That a comparatively small sum of money as the contribution of each of the interests involved, but making in the aggregate a well-furnished war-chest, would suffice is practically certain. No doubt much money would require to be spent if the campaign above described were to be undertaken thoroughly. But it would surely yield its return. It ought not to be too difficult to get a guaranteed amount which would be quite adequate from Governments, growers, transporters, brokers, merchants and retailers, united in a common endeavour in the proposed league to push the sale of coffee. Moreover, their representatives elected for the purpose would have the allocation and management of the common fund and that for which it was expended, and could ensure due economy with efficiency. The question is: Who will take the lead in this matter? Why should not a preliminary meeting be held in London to consider it?

[The writer of the above evidently knows nothing of the scheme that has been under the consideration of the London Chamber of Commerce and the U. P. A. S. I. If he secures a good backing in England, so much the better.—ED., *P. C.*]

RUBBER.

In Hawaii.

At the Rubber Conference held at Honolulu on January 23, 1911 (referred to in the last number of *The Planters' Chronicle*), Dr. E. V. Wilcox, director of the United States Agricultural Experiment Station at Honolulu, spoke as follows :—

One of the things that strikes me, in looking into the history of the rubber industry in Hawaii, is the fact that the men who have borne the burden of the finances of rubber here have had a very good, steady nerve all the time. When we stop to think that at the start nothing was known as to whether rubber would succeed here or not, that the expense of managing rubber was not understood, that it was not known what the yield would be, and, furthermore, the whole proposition of managing Ceará rubber as a plantation business rather than wild trees, was almost entirely new, and we had next to no information on it at all, I say it required good business enterprise to start in and plant as has been done in Hawaii and keep the business going.

When we first began work on the rubber here, the first tapping and experiments were carried on by Mr. Smith, and they indicated that satisfactory yields could be obtained, that the trees were actually producing quantities which were promising, and immediately we began on the methods of tapping. I was impressed, while listening to Mr. Anderson's paper this morning, with the idea of the necessity of varying the tapping methods as the trees became larger, and I have no doubt that other modifications may be found very desirable when the bark becomes a little thicker and the trees become larger. When we started in tapping, the cut was made in only one direction, and it was necessary to use the upright cut in order to get a sufficient area or surface of the bark, but it soon became evident that when the rainfall was heavy there was a high pressure and that the trees had actually popped and split open. Under those circumstances, it may relieve the pressure so that the flow will not be so extensive.

The manner of cultivation of rubber trees is one of the most important things in the industry. Like Mr. Williamson, I went over all the plantings of all the companies last May, and I think it was shortly after that I went over to Pusa Plantation, too, and was able to observe very carefully the growth of trees which cultivation and without it. It is a very serious proposition on account of the very rough nature of the land. It simply means promptly getting rid of the weeds and giving the sun a chance to get at the soil. In my opinion, it is not necessary in rubber cultivation to stir the soil very much after the trees have once gotton a start, if you keep the ground clear so that the sun can get at it. Any statement that you may make regarding the cultivation of soils in Hawaii will have to be taken with some reservation as this statement will apply only to the particular lands in question. In soils which can be puddled, one of the prime requisites in getting a crop from anything, is to keep off the land when it is too wet. In some of the districts in Nahiku, it will be seen that the manager would have a very easy job, because it would be raining most of the time, and yet something must be done. The weeds could not be annihilated because it is so wet that they, after being hoed, would again grow up. No plant can grow without air any more than an animal can, and if you shut out the oxygen it would die in a short time and it will show the effects of the lack of oxygen very quickly.

One of the most striking things to me on looking over all the plantings and comparing them with about a year before, was the great changes that had taken place in the physical appearance of the soil where this weed eradication had been carried on. In some places the soil was mud and the horse went along in the mire. After the weeds were removed, the superficial water ran off and many of those places were actually more or less dry. There was a very noticeable difference and the air was going into the soil and the trees were growing.

Now, from the results that have been had so far in growing rubber in Nahiku, it seems to me that we may be sure that a tree large enough for tapping can be got inside of five years. I do not think that unreasonable. Inside of three years we could get them, with the best cultivation, but five years is plenty of time to allow to get a plantation of good size for convenient tapping. It is not possible by any means to get Ceará without cultivation. You can go about the plantations and see trees three years old with cultivation that are larger than trees five years old without cultivation, in similar conditions. That saving of two years is, of course, of immense advantage. It might make all the difference between succeeding and not succeeding, keeping the stockholders encouraged and having them discouraged, and having the question of financial backing trembling in the balance all the time.

Of course, I have heard some expressions of slight disappointment from time to time at the results of tapping experiments which have been carried on here. I think we have been unduly enthusiastic about the yields which we are going to get, and particularly in Hawaii we are always looking for too large profits. But the results indicate, as Mr. Anderson said this morning, very clearly that a reasonable profit can be obtained from the rubber trees as they stand, and this is the time to settle the matter, so far as we can tell now, as to whether the rubber is an industry here or not. If you can take trees that were planted five years ago with no special knowledge as to what ought to be done to rubber here, starting in on an industry of which there was absolutely nothing known to us, and, after making some mistakes, still get trees which will yield a profit in five years, it seems that would settle the point as to whether there is a reasonable profit in caring for rubber trees, for every man who has charge of rubber work on every plantation is now armed with a whole arsenal of information.

The yields, as I look at it, are very encouraging. We are dealing with young trees that are more or less lacking in uniformity because they did not receive the same line of treatment. We had had different methods of tapping and while there may be a hesitation on the part of some as to the foundation of getting enormous profits, there must be big profit in the business when we can take it out at 50 cents a pound and sell for $4-0 with the unskilled labour here.

One thing that appears interesting to me in the experiments of the Nahiku Rubber Co. under Mr. Anderson is the fact that boys do the work very well. It is not a heavy class of work ; it does not require much brute force. It merely requires a little manual skill and dexterity. They are very quick in collecting the rubber. It is all light work, and they can easily carry a bucket, perhaps faster than a grown person, and do the work just as well. That indicates that in that cheap labour we can find a solution of the problem of reducing the expense, provided the price of rubber should fall below where the rubber growers might wish it to fall.

In the matter of diseases, and the insects and posts of rubber, I do not believe they are very serious so far. It may be that some will develop of

which we know nothing now and there are but few instances of trees which have been seriously affected by the shot-hole fungus or even with rats, as soon as the ground in between the trees has been cleared up.

Another point is the matter of altitude. I don't know whether it would be wise, it never is commercially, to try to find the limit of altitude in which rubber can be grown, but in going over the plantations last May I was enabled to note that the rubber grew as well 1,400 feet as it did at some lower elevations where it received the attention that it deserved. However, an altitude up to 1,300 or 1,400 feet does not seem to affect the rapidity of of the growth.

The question of the kind of rubber to be grown here is somewhat left open yet, but the decidedly more rapid growth of Ceará seems to indicate that that is the one upon which we can depend at present. There is also the Hevea and the Castilloa, which have been discussed. There have been at times a number who have been enthusiastic about the growth of Hevea, but it is so slow as compared with Ceará and is affected so much more by the winds and altitude, for it seems to dwindle out at 1,000 or 1,100 feet, that it seems that the Ceará tree is the one to grow here. And as to the rapidity of growth, we may say that the Ceará does remarkably well here and is perfectly satisfactory as to the rate of growth, and in the most part in the shape of the trees.

Referring again to the tapping experiments which Mr. Anderson has been carrying on, I would suggest that a device might be gotten up which would hold several knives at the same time. That might be possible if we had several trees the same size in trunk; one knife might not cut as deep as the other knife, and in straight cuts a device something like the instrument that was submitted to Mr. Hosmer from a Mexican rubber expert might be modified, in such a manner as to carry several knives, but the device itself would have to be worked out right on the plantation. As a matter of fact, all of the actual, practical details of how to make rubber economically have to be worked out by the man who has charge of the plantation. We cannot depend upon any man who has other things to bother about and is looking at it from a different standpoint from the man who is interested in it. He cannot work at the practical details. . . .

One of the things in getting success is not to be too enthusiastic at first, not to expect three or four hundred per cent., not to expect that the crops are going to grow without attention, and not to expect that there is going to be no trouble. The plants require attention. It requires not only money, but brains and industry joined together and applied to the business at all times in order to make a success of it, and I honestly believe that the results which we have gotten so far from rubber show that not only have there been men with the courage to put their money into it, but that the work which has been done by the men who have had practically to manage this business, has been conscientious and has brought about results which are all that any reasonable man can expect, and so, gentlemen, it seems to me that these results are very encouraging at the present time. If you can get profit from the trees you have now I do not see that there should be any worry about the methods. In looking after the little details which may improve the business from your standpoint, the proposition to unite the companies together I believe would be a very fine scheme, indeed. It would accomplish just what Mr. Williamson said it would. It would be more economical. You need to have a large plant in order to manage the thing economically. If you are going to have such a thing on the market as Hawaiian rubber, it should be always of the same

quality, so that the market can be kept up, so it seems to me that the rubber situation would be greatly improved if the companies were united on an equitable basis.

In Ciudad Bolivar.

Block balata was shipped in 1910 to the extent of 1,880 metric tons of the declared value of £451,275. This is again the largest quantity and the highest value reached in any one year up to the present. The principal supply now comes from very distant parts beyond the Caroni and Paragua Rivers, and from both sides of the Cuyuni near the frontier of British Guiana. It is estimated that these forests contain a further four years' supply. After that period it is difficult at present to see where any considerable quantity can come from, and even now these distant parts can only be exploited while prices of balata gum remain high. Should they at any time recede below 1*s*. 9*d*. to 2*s*. per lb. it appears that it would be impossible to continue the exploitation at a profit. It is said that even now a large proportion of the block balata shipped is not the pure article but is mixed with gums from other trees like the Pendare, Purguillo, Mata Palo, &c. It appears that these latter gums alone would scarcely find a good market, and they are therefore in many cases worked in with the balata in the proportion of one in three.

Tapping Castilloa Rubber.

The *Journal of the Jamaica Agricultural Society* for October (Vol. XIV, No. 10) contains an article by Mr. L. A. Wates giving some conclusions he has reached in the course of tapping Castilloa rubber trees in Portland. It is stated that experiments were made on 37 trees varying in age from 8 to 14 years, and in girth from 20 to 65 inches, with the soil poor and unsuited to rubber cultivation. One of the trees, about 15 years old, growing on a stony, red, hot soil, gave 25½ ounces of rubber at the first tapping. Mr. Wates accounts for this in two ways: First, the tree always had its trunk shaded by shorter trees, causing the bark to grow thicker, and thus giving a larger surface of latex-bearing tissue; second, at some time in its young growth the tree was topped, causing it to fork, giving larger girth near the ground and available for tapping. In each case the forked trees gave best results, leading him to the conclusion that topping trees at 12 feet is advisable.

The tree yielding 25½ ounces at first tapping ceased to give latex at the end of three months, after being tapped at regular intervals of thirty days. After a rest of four months the tree yielded 7 ounces, and up to date the tree had yielded 41 ounces. In connection with his other experiments Mr. Wates concludes that a tree on moderate soil at 8 or 10 years of age should be at least 40 to 45 inches in girth, and yield 4 or 5 ounces of rubber at the first tapping. But frequent tappings of Castilloa by methods used for Hevea are useless, and it is the opinion of the writer that trees should be tapped either three or four times a year at equal intervals, and that growth and girth rather than age should determine the time for tapping unless conditions were equal and the age well established.

Methods of tapping and some of the difficulties to be overcome are discussed at some length. In conclusion, Mr. Wates says that taking into consideration the fact that these experiments were made on rubber trees growing in dry, marly, red dirt, in many cases on hilltops, or in open pastures, he is still of the opinion that Castilloa rubber growing may be a profitable enterprise.

The Planters' Chronicle.

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THE U. P. A. S. I.

(INCORPORATED.)

Obituary.

Planters will learn with deep regret of the death on the 28th June, at the age of 5 years and 5 months, of the only child of Mr. and Mrs. R. D. Anstead. The little boy was taken ill at Coonoor a couple of weeks ago and was ill when he returned to Bangalore on the 21st June, but no serious results were anticipated, and the end came very suddenly, and was a terrible shock to the bereaved parents.

On that very day the Scientific Officer was to have left for the Shevaroys, but arrangements were at once made by telegram to cancel the short visit that had been arranged there. It may, possibly, be made towards the end of July.

That all planters will condole sincerely with Mr. and Mrs. Anstead goes without saying.

The Late Mr. R. D. Tipping.

Mrs. R. D. Tipping, before leaving for England expressed her sincere and heartfelt thanks to the members of the U. P. A. S. I. and Council and to others for kind expressions of their sympathy.

Hybridisation of Coffee.

With reference to the scheme mentioned on p. 345 (Vol. VI, No. 24) it may be stated that estimates of cost of upkeep of the proposed Coffee Experiment Plot have been submitted for the consideration of Councillors of the U. P. A. S. I

It may be desirable to mention that this scheme has always been distinct from the Experimental Plots suggested by the Scientific Officer at the Annual Meeting last year. The latter were designed for planters themselves to carry out experiments, with occasional hints from Mr. Anstead, but the former was designed to carry out special work on Coffee hybridisation, work which is highly technical and which the average planter has neither time nor training for, and work, therefore, which must be supervised by a scientifically trained man. The Nilgiris was chosen as a suitable place because it was a coffee district suffering from a disease in an acute form and so likely to benefit most from a disease-resistant hybrid. Moreover the disease being on the spot trials with it would be easy to make and would eliminate the danger of introducing the disease into a district where it does not exist. Finally, a man capable of aiding Mr. Anstead in the work and watching over the plot during his absence was to be had in the Nilgiris in the person of Mr. Butcher, the Curator, Gardens and Parks, Nilgiris.

Scientific Officer's Papers.

LXVIII.—ANALYSES OF FERTILISERS.

In 1895 a Fertilisers Act was introduced in Queensland to protect farmers from fraud when purchasing manures. In the *Queensland Agricultural Journal* for May the Agricultural Chemists, Mr. J. C. Brunnich and Mr. F. Smith, publish a report showing the composition of all the different fertilisers which have been examined under the Act during the year, and briefly describe the working of the Act. The preliminary part of this report is so interesting that it is reproduced here. It will be noticed that the new fertiliser, Nitrolim, is mentioned and that satisfactory results have been obtained with it. Nitrolim is being experimented with in several districts in India on Tea and Coffee, and it should be given a thorough trial in all districts. Messrs. Brunnich and Smith recommend it for Queensland soils of which a great number are deficient in Lime. Our Indian soils are notoriously and generally deficient in this constituent, and I believe that, as in Queensland, so in India, our soils will derive particular benefit from fertilisers like Nitrolim. The following are extracts from the report:—

"In accordance with the Act, every dealer, manufacturer, importer, or agent who deals in fertilisers for the purposes of trade is required to register each year, giving the names or brands of fertilisers dealt in by him. We have now fifty-six registered dealers in our State. Upon the sale of any fertiliser the seller must supply to the buyer an INVOICE CERTIFICATE signed by the seller or his agent, stating full name and place of business of the seller, trade mark, brand, or other sign used to identify such fertiliser; quantity of the fertiliser or net weight in lbs.; and the composition of the fertiliser, giving the respective amounts of nitrogen, phosphoric acid, and potash contained therein. Such a certificate can be attached in form of a label to each bag or package, or it may be supplied separately in form of printed slips, but the BAG MUST BE DISTINCTLY BRANDED with the number of net pounds of fertiliser in the bag or package, and the figure, trade mark, or sign, under which the fertiliser is sold.

"The latitude allowed under the Act, in any DEFICIENCY in the composition, in order to allow for slight variations in manufacture, is a fairly liberal one, amounting to 5 per cent. of the total nitrogen or potash certified to be present, if the fertiliser contains not less than 10 per cent. of nitrogen or potash, and 7 per centum of the total phosphoric acid certified to be present, if the contents of phosphoric acid are not under 15 per cent. In the case of fertilisers containing smaller amounts of fertilising ingredients, less than 10 per cent. of nitrogen or potash, and less than 15 per cent. of phosphoric acid, the amounts of deficiency allowed are—nitrogen and potash ½ per cent., and phosphoric acid 1 per cent.

"Hitherto great confusion has existed through stating the composition of fertilisers in various ways, giving, for instance, phosphoric acid as bone phosphate, tricalcic phosphate; nitrogen as ammonia and ammonium sulphate; potash as potassium sulphate and potassium chloride, &c. All such statements only mislead the farmer, and to avoid this, the Act provides for the statement of the valuable fertilising ingredients in percentage amounts of Nitrogen (N), Potash (K_2O), and Phosphoric Acid (P_2O_5).

"Nitrogen is the most expensive of all the fertilising ingredients of a manure, and is chiefly supplied in form of NITRATE NITROGEN, as in Chili saltpetre, or in form of AMMONIA SALTS, as in ammonium sulphate, or in form of organic nitrogen, as in blood, meatworks manure, &c. Nitrate of soda is a very quick-acting manure; nitrogen in the form of nitrate is in the most available form, but nitrates are not readily retained or absorbed by the soil, and therefore liable to be washed away by heavy rains. Nitro-

gen in ammonium sulphate is not in such an available form, as it has to be changed into nitrates by the process of nitrification. Favourable conditions and lime salts are necessary for the process, and in soils very deficient in lime this manure, therefore, may give poor or no results. Ammonium salts are retained and absorbed by the soil, and losses in the drainage water are not to be feared.

"Of particular interest are the samples of NITRATE OF LIME, and NITROLIM, or CALCIUM CYANAMIDE, of which large quantities are being imported.

"These artificial fertilisers, which are really produced from nitrogen in the air, have given excellent results in a very large number of manuring trials, conducted the last three or four years, all over the world. I believe that our soils, of which a great number are rather deficient in lime, will derive particular benefit from these nitrogenous manures. The form of nitrogen in nitrolim is apparently nearly as available as the nitrogen of nitrates, much quicker in action than ammonia nitrogen, and not depending on the presence of lime in the soil. Nitrate of lime has the great advantage over nitrate of soda of not draining so easily through the soil. Nitrate of soda rather tends to exhaust soils, and spoils their physical conditions by depriving them of the lime, which faults are prevented by using nitrate of lime. Nitrolim is a very fine, slate-black powder, not liable to cake. As already stated, the action of this manure is only slightly slower than that of nitrates, and the large amount of lime (up to 50 per cent.) which it contains is in itself a great advantage. I believe that this new manure will prove of great value to our pineapple farmers and cane-growers.

"The effect of all artificial fertilisers will be very much increased if small quantities of STABLE MANURE can be applied at the same time. The presence of organic matter in the form of HUMUS is of the greatest importance to keep up the fertility of a soil; and in a loose, well-worked soil the manures are always more effective.

"When we consider the functions of the various plant foods, it may be stated as a general rule that potash, which is found most abundantly in young leaves and twigs of plants, is intimately connected with the production of starch, sugar, and other carbohydrates in the leaves, and subsequent transference of these bodies to the fruits. Part of the potash is generally returned back to the soil after it has done its work in the plant.

"NITROGEN promotes the growth of leaves and stems, and rather retards maturity and development of buds and flowers. The leaves show generally a deep green colour, and the whole of the plant becomes more vigorous in its growth by the application of nitrogenous manure. The amount of nitrogen in the plant itself and corresponding amounts of proteins are generally increased.

"PHOSPHORIC ACID has a rather ripening effect on plants. Phosphates are generally found in the seeds, partly in association with the proteins and partly associated with fats, more particularly in Lecithin, a highly nutritious fatty compound, found in many seeds. No plant would produce seeds unless a sufficient quantity of phosphoric acid in the form of phosphates is present in the soil.

"LIME aids in decomposition of organic matters, and also converts many compounds into a more available form. Its chief action, however, is to improve the physical condition of soils, particularly loosening heavy clay soils, and also, again, giving body to light sandy soils. Lime also counteracts any acidity produced by decaying vegetable matters."

RUDOLPH D. ANSTEAD, *Planting Expert.*

Notes and Comments by the Scientific Officer.

113. *Fumigation and Treatment of Seed.*—In order to avoid the possibility of introducing new pests, many countries have passed a law to have all imported seeds and plants fumigated, or treated with fungicides, at the port of entry. It will be remembered that it has been proposed to pass a similar Act in India. (See *P.C.*, Vol. V, pp. 497, 504.) In British Central Africa, Tea Seed from India and Ceylon must be fumigated on arrival with Carbon bisulphide and then soaked in formaldehyde of a certain strength for an hour. A similar treatment is adopted for other seed imported from any country known to have disease.

Treatment with Formaldehyde will in no way reduce the germinating power of seeds. All such fungicides used for the disinfection of imported seeds have been most carefully tested and only those adopted as standards which do not effect the germinating power of seeds. If the seed is to be repacked after treatment it should be spread out in the shade to dry, as otherwise the moisture may cause it to begin germinating, which may not be desirable. This, I should say, would be especially necessary in the case of Soya Beans; the soaking would be sure to make them begin to grow unless they were redried.

114. *Disinfection of Tea Seed.*—In Note. 110, I advised that all Tea Seed imported from Northern India should be disinfected in order to prevent the possible introduction of the Blister Blight into Southern Indian Tea Districts, and I recommended Corrosive Sublimate as a suitable disinfectant. I have recently had an interesting letter on the subject from Mr. G. D. Hope, the Scientific Officer of the Indian Tea Association, in which he very kindly points out that experiments show that Formalin is a much better disinfectant. Mr. Hope writes as follows :—

"A year ago I had some conversation and correspondence with Dr. Butler, the Imperial Mycologist at Pusa, on this subject and he was in favour of using a solution of Formalin in preference to Corrosive Sublimate for this purpose. Undoubtedly Corrosive Sublimate is as good a disinfectant as can be found for use on a small scale, but the chances of parts of the surface of tea seed failing to be thoroughly disinfected by such a solution, owing to the adherence of small air bubbles must be very great when several maunds of seed are disinfected at one time. The advantage of a formalin solution in this respect lies in the fact that formalin is volatile, and would thus reach parts of the surface of the seed even if these were not actually wetted.

"I enclose for your information a copy of a circular letter which was published by this Association last year."

The Circular referred to is B/No. 14, dated 31 March 1910, and reads as follows :—

"Formalin is largely used for the purpose of disinfecting seeds. Commercial formalin consists of 40 per cent. solution of formaldehyde, which is a powerful disinfectant. Tea Seed can conveniently and safely be treated with a 0·25 per cent. solution of commercial formalin. This can be prepared by mixing commercial formalin with water, in the proportion of 1 volume formalin to 400 volumes of water. Tea seeds should be placed in such a solution for two hours and afterwards taken out and carefully dried by exposing to the air in a clean cool place. During drying the seeds should be turned over occasionally so as to expose them to the air on all sides."

In view of this, therefore, I trust that planters interested will adopt the Formalin method of disinfection, and will pay particular attention to the fact that seed imported from infected districts should be disinfected.

RUDOLPH D. ANSTEAD, *Planting Expert.*

CORRESPONDENCE.

Curing of Coffee in Guatemala.

SAKLASPUR, June 1911.

Dear Sir,—I have read with interest the article in your issue of 3rd June under the heading *Particulars Regarding the Curing of Coffee in Guatemala.*

In the para. referring to drying the Author after explaining the disadvantage of the drying machine goes on to say "The drying-ground serves as a useful substitute in bringing the produce to the state in which it can be stored without any fear of its becoming mouldy:" and then he adds "but the final drying should be done in the sun if possible." I wonder if where the writer uses the word "drying-ground" in above para. he means "Dryer?" The context of the sentence preceding makes me think so.*

This final Drying seems to correspond to that done by our Curers on the coast, so as to crisp up the parchment and make it fit for the Peeler. Of Artificial drying Mr. Helmrich says: "a regular temperature is essential, or the coffee will deteriorate." This being so may not also the variable temperature, one has to contend with while drying out here in the sun, have the same effect as is the case when an uneven temperature is allowed in "Dryer?"

It would be interesting to know if the product produced by Artificial drying is of a brighter and more uniform colour than that which has only dried in the sun; and if so, whether this is due to its quicker and more even drying? Possibly some of your readers, who have had experience of both, would be able to answer the question. It may be that we owe the difficulty of obtaining a uniform colour to the neglect of quick drying? It is a question well worthy of investigation, as given an even coloury sample "East Indian" can hold its own against the coffee of any other country, even in its small sizes. Mention is also made by Mr. Helmrich of a *smooth Smout* as being used for peeling; I wonder if this differs in any way from that "Smout" that was in use out here some years back? and which was replaced by the "Edge-Runner" on account of complaints from Buyers that it injured the surface of the beans. I may add, however, that I have heard it said that the beans were only injured if coffee was not perfectly dry, and that "perfectly dry" meant a uniform dryness and not coffee that had been bleached by overdrying, which would when polished up by "Smout" look even worse than a damp sample; though latter would not of course keep long.

E. W. R.

[*A reference to Messrs. Peirce, Leslie & Co., Ltd., Calicut, has elicited the fact that "drying ground" was inadvertently substituted for "drying drum," apparently owing to a mistake on the part of a shorthand writer. —ED., *P. C.*]

H. M. Embassy at Tokio report that regulations came into force on 5th May forbidding, under penalty of a fine of not more than 100 yen (about £10-4s.), the manufacture of and dealing in (1) tea manufactured by using adhesive substances, or tea so manufactured mixed with other tea; (2) tea coloured with some substance, or tea so coloured mixed with other tea; (3) putrefied tea, or putrefied tea mixed with other tea; (4) tea mixed with sand or other impure substances.

TEA.

Experimental Tea Plots in Ceylon.

PERADENIYA.

In the latest Ceylon Botanical Gardens Circular Messrs. M. Kelway Bamber and J. A. Holmes say:—

The last circular on the results of green manuring and other experiments on these plots gave the yields up to the end of 1909. All the fields were out of bearing during the latter part of that year and came into bearing again in December, so that the present year's yields represent a full twelve months.

At the last pruning the Singlo Jât fields were out of bearing for four to five months, the Assam hybrid for three months, and the Manipuri indigenous only two months. Plucking weekly throughout the year has been to the whole leaf except two rounds to the fish leaf in October, to keep the bushes in check.

The growth generally has been excellent, and in the cattle-manured plot the bushes are almost too high for convenient plucking. The improved growth during 1910, even in the untreated plots, is mainly due to a heavier rainfall and a careful and clean pruning followed by the plucking system mentioned; and there is no doubt this is the most efficient way of renovating tea, and enabling the bushes to respond more freely to cultivation and green or artificial manuring.

In 1909, for the first time, the alternate lines were forked and the prunings heaped with the application of 200 lbs. basic slag and 60 lbs. sulphate of potash by the heaped row. On plot 143 the prunings were buried with the same amount of slag mixture.

Green Manures.—Plot 141, in addition to heaping the prunings, cheddy, and jungle green material, was heavily mulched up the same lines. The improvement in the bushes and yield is very marked. This plot had 200 lbs. solubles early in 1910, after two previous similar applications of 100 lbs. in March and September, 1908.

PLOT 142.—The Indigofera was cut and mulched in March, April and June, the total yield being 8'738 lbs. It then became very woody and was uprooted, the weight of roots being 602 lbs., or a total crop of 9,340 lbs. per acre, the whole cost from sowing to pulling being R21'45 per acre. The improvement of the bushes has been very marked, and the yield was 756 lbs. although there were over 32 per cent of vacancies.

PLOT 147.—The Crotalaria in this plot sown just before pruning in October, 1909, was bent down instead of being cut, but the results as regards a thick low growth were poor, and it was cut and mulched in April, yielding 1,194 lbs. Another small crop was obtained in July, giving a total of 1'668 lbs., this small yield being due to the Crotalaria having run to seed after bending down. It then gradually died out. The total cost of bending and subsequently cutting and mulching per acre amunted to R9'90.

PLOT 148.—In this plot the Crotalaria was cut and mulched in the usual way in February and April, the total yield being 2,044 lbs. per acre. A later cutting in July gave 2,916 lbs., and a fourth cutting in September 790 lbs., bringing the total for the year to 5,750 lbs., or about 2 tons 11-1-5 cwt. per acre. The Crotalaria then died down. The total cost of cutting and mulching the green manure crop was R8'25 per acre.

Both these plots look well.

PLOT 149.—The Dadaps were lopped three times during the year, giving 6,492 lbs. per acre. The loppings were mulched up the same rows where the prunings had been heaped after forking. This plot continues to give the heaviest yield, and the bushes look remarkably healthy. The total cost of treating this green manure during the year was R5·25.

PLOT 150.—The Albizzias were lopped once during the year, giving 2,732 lbs of green material, which was mulched in the usual way. The cost was R2·64 per acre. The bushes look healthy, but have not the vigorous appearance and dark green colour of the Dadap plot.

As these trees are getting too large, supplies have been interplanted to take their place.

PLOT 151.—In August 1910, this plot was sown thickly with *Crotalaria striata* in every row, partly to act as a green manure, and partly to try and smoother the persistent growth of *Cyperus rotunda*, "Cora." It failed in this latter respect, and was cut and mulched between the rows. The bushes have improved and the crop increased, but this was due to other causes, as the Crotalaria was only cut in November.

PLOTS 151 to 154.—were supplied with Pará rubber, which is now established.

PLOT 155.—This was cattle-manured in March, 1908, at the rate of 30 tons per acre, and a further application was given in 1910 to the poorer bushes on a steep slope of very poor soil. The bushes look well, and the actual yield has increased from 648 lbs. in 1909, when the field was pruned and out of bearing for thee months, to 269 lbs. in 1910.

The results obtained from the various plots confirm the beneficial effects produced by systematic green manuring, and point to the fact that it should be possible in a few years to minimize, if not do away with the application of nitrogenous artificial manures at least for a time. The mixture of basic slag and sulphate of potash applied for the first time at the last pruning in 1909 has no doubt contributed to the improvement by supplying not only available phosphoric acid and potash, but a certain amount of lime for the more perfect nitrification of the rapidly increasing nitrogenous matter in the soil.

Green manuring in tea is now very generally adopted at all elevations, with invariably beneficial results, but much time has been lost on some estates through a lack of perseverance in constant supplying and in not planting out at the right time, also from insufficient care in holing and the preparation of the soil. A frequent objection is the expense of keeping the shade trees cut, but the permanent beneficial results to both the bushes and the soil for more than compensate for this cost. A greater difficulty is finding the coolies to lop the trees, &c., at the right time, as the growth is most rapid when the tea is flushing best; but with forethought this can be lessened to some extent by cutting the green manure prior to the best growing months in the spring and autumn of the year.

For some reason *Crotalaria striata* does not appear to be growing as freely as formerly, and it is difficult to establish a thick growth; *Tephrosia candida* can in many instances take its place with advantage.

For the low-country below 1,500 ft. Albizzias are more useful and grow better than Dadaps. It has been found that if planted in showery weather, Albizzia cuttings take readily, and much time can be saved in establishing a uniform growth.

Above 1,500 ft. and up to 4,000 ft. both the Dadap and Albizzia grow well, but the former yields rather more green material per tree per annum, and in most cases stands cutting better. At the Experiment Station the Dadap plot planted 16 ft. by 16 ft. in July, 1904, has yielded about 36 tons of green material, while the Albizzias planted the same time 25 ft. by 25 ft. have yielded 11·9 tons. Calculated to the yield per tree the ratio is about 3 to 2·4.

Above 4,000 ft. *Acacia decurrens* has given the most satisfactory results, especially in free soils and where the rainfall is moderate. In cold wet soils it does not stand cutting well, and is liable to root disease.

In establishing green manures in old tea, it is advisable to prepare the soils and if very poor and washed, to give a small application of artificial manure. Cuttings should be of a good length and planted as fresh as possible, at least 12 in. to 18 in. being in the ground. One or more seeds should also be sown at the same time to insure an even plant rapidly, and prevent the loss of a whole season.

The Use of Artificial and Chemical Manures.

The following appears in *The Indian Tea Association, Scientific Department, Quarterly Journal, Part II, 1911* :—

[This article is written in response to an inquiry, on the part of the Dibrugarh circle, Assam Valley Branch, Indian Tea Association, as to my opinion of the value of the Chemical manures supplied by Calcutta houses, as manures of tea.—G. D. H.]

The general question of the profitable use of manures resolves itself into several questions of subordinate value.

In the first place it must be determined when their application is necessary or desirable, and when this has been decided, the suitability of the different kinds of manure must be considered, and a general scheme of manuring arranged. In general it may be taken that manuring should not be done at the expense of cultivation—that is to say money spent on manures which might be spent on cultivation is money spent uneconomically. Good cultivation is the first essential in agriculture and except in certain cases which we will mention below, it should be sufficient to keep the tea in a state of health and vigour. The effect of cultivation is to render available substances, which exist in the soil largely in a form in which they cannot be made use of by plants. Good tea soils contain in sufficient quantity the ingredients required by plants, and adequate cultivation results in a response on the part of the bushes.

There are cases, however, where manuring is desirable, and others where it is necessary, even where its purchase and application result in a decrease in the amount of money spent on cultivation.

Such cases are :—

(1). *For Old Tea.*

Old tea does not show the same response to cultivation as does younger tea, and unless it is manured it does not maintain its vigour but shows an increasing tendency towards deterioration. This deterioration is also in many cases accelerated by the simultaneous exhaustion of the soil, and therefore the actual age at which tea bushes begin to show a want of vitality such as necessitates the use of manures in addition to cultivation, depends upon the nature of the soil as well as upon the age of the bush. The sandy soils of Assam are capable of maintaining tea bushes in a state of vigour to a great age, and it is probable that the red Bank soils of the

Dooars and the red soils of Darjeeling tea districts will prove to be similar in this respect. Tea bushes show signs of old age sooner in the grey, sandy soils of the Dooars and Terai. Irrespective of the nature of the soil, old tea requires to be manured, but a point is finally reached when this becomes economically unsound, and the tea should be abandoned. No general rules can be laid down for such cases, but each must be decided on its own merits.

(2). *Where the soil is deficient in one or more of the chemical constituents required by the bush, or they are not present in the soil in sufficient quantities in an available form.*

Chemical analysis of the soil throws some light on this subject, but it is not sound to base large schemes of manuring on a consideration of the chemical composition of the soil alone. However, it may be made the ground-work in schemes of trial of manures which may have to be modified later when due information as to their suitability is obtained.

(3). *Where the mechanical texture of the soil can be improved by their application.*

Cases where manuring under this heading is required are many, but probably the action of manures on the textures of the soil does not usually receive sufficient consideration owing to the general tendency to forget that it is the soil and not the tea bush which directly receives them. Top dressing a clay flat with sandy soil is a case in point. The value of lime, bulky manures containing large quantities of organic matter, green crops, etc., for land for which they are suitable is due to the effect they have on the physical properties of the soil. Lime tends to improve the texture of heavy clay soils. Organic matters in any form improved the tilth of very open sandy soils, or heavy clays. On soils of the latter type we would recommend experiments with lime, basic slag, and nitrolim, the two latter containing free lime as well as phosphoric acid in the former case, and nitrogen in the latter.

(4). *In order to give a stimulus to bushes in cases where they have been subjected to severe conditions such as hail damage, heavy pruning, drought, &c.*

In this case we would generally recommend the use of complete manures, by which we mean manures, or manurial mixtures containing nitrogen, potash and phosphoric acid. Several of the manurial mixtures on the market may be suitable for this purpose. A mixture of sterilized Animal Meal, which contains roughly 8% of nitrogen and 12% of phosphoric acid, and wood ash may be used also, or bones, oil-cake, and wood ash.

The above are examples of cases where manurial treatment is required, and where cultivation alone is not likely to effect improvement in conditions.

Secondly, when it has been determined that manuring under one or more of the above headings is necessary, it remains to decide (*a*) what manures are the most suitable for the purpose, and (*b*) what scheme of manuring should be adopted.

It will be most convenient to consider (*b*) first.

Manuring under, the above headings (1), (2) and (4) reduces itself to application in appropriate quantities, and proportions of suitable compounds of one or more of the three substances Nitrogen, Phosphoric Acid and Potash, which are necessary to the growth of the plant, and which in many cases are not present in sufficient quantities, or in a sufficiently available form in the soil. Other substances such as Lime, Magnesia, Sulphur, etc.,

are present in sufficient quantities in the form of soluble compounds in normal soils, and it is not necessary to supply them in the form of manures.

Various schemes for the application of manures have been drawn up as the science of Agriculture has progressed. Nearly all are open to criticism. In this connection the following quotations from a recent publication of U. S. A. Department of Agriculture are worth noting :—

"It must be remembered, then, that only general rules apply in the use of fertilizers upon soils of different classes, and that they are modified by both the chemical composition and the mechanical condition of the soil. The best use of a fertiliser—that is, the greatest proportionate return of plant food in the crop, all things considered—is obtained from its application upon soils that possess 'condition,' or that are well cultivated or managed. Full returns cannot be expected when they are applied upon soils that are too wet or too dry, too porous or too compact, or too coarse or too fine. It is important that even the best soils should be properly prepared, and it is infinitely more important that those which possess poor mechanical condition should be improved in this respect before large expenditures are made for fertilizers."

"The system of fertilization which has perhaps received the most attention, doubtless largely because one of the first presented, and in a very attractive manner, is the system advocated by the celebrated French scientist, George Ville. This system, while not to be depended upon absolutely, suggests lines of practice which, under proper restrictions, may be of very great service. In brief, this method assumes that plants may be, so far as their fertilization is concerned, divided into three distinct groups. One group is specifically benefited by nitrogenous fertilization, the second by phosphatic, and the third by potassic. That is, in each class or group one element more than any other rules or dominates the growth of that group, and hence each particular element should be applied in excess to the class of plants for which it is a dominant. In this system it is asserted that nitrogen is the dominant ingredient for wheat, rye, oats, barley, meadow grass, and beet crops. Phosphoric acid is the dominant fertilizer ingredient for turnips, Swedes, Indian corn (maize), sorghum and sugar-cane ; and potash is the dominant or ruling element for peas, beans, clover, vetches, flax and potatoes. It must be understood that this system advocates only single elements, for the others are quite as important up to a certain point, beyond which they do not exercise a controlling influence in the manures for the crops for three classes. This special or dominating element is used in greater proportion than the others, and if soils are in a high state of cultivation, or have been manured with natural products, as stable manure, they may be used singly to force a maximum growth of the crop."

"Another system which has been urged, notable by German scientists, is based upon the fact that the mineral constituents, phosphoric acid and potash, form fixed compounds in the soil, and are, therefore, not likely to be leached out, provided the land is continuously cropped. They remain in the soil until used by growing plants, while the nitrogen, on the other hand, since it forms no fixed compounds and is perfectly soluble when in a form useful to plants, is liable to loss from leaching. Furthermore, the mineral elements are relatively cheap, while the nitrogen is relatively expensive; and thus the economical use of this expensive element, nitrogen, is dependent to a large degree upon the abundance of the mineral elements in the soil. It is, therefore, advocated that for all crops and for all soils that are in a good state of cultivation, a reasonable excess of phosphoric acid and potash be applied, sufficient to more than to satisfy the maximum needs of any crop,

and that the nitrogen be applied in active forms, as nitrate of ammonia, and in such quantities and at such times as will insure the minimum loss of the element and the maximum development of the plant."

"Another system of fertilization is based upon the theory that the different plants should be provided with the essential elements in the proportions in which they exist in the plants, as shown by chemical analysis. Different formulas are therefore recommended for each crop, the constituents of which are so proportinate as to meet its full needs. This method, if care is taken to supply an abundance of all necessary constituents, may result in a complete though perhaps not an economical feeding of the plant, since it assumes that a plant which contains a larger amount of one constituent than of another requires more of that constituent in the fertilizer than of the others. It does not take into consideration the fact that the plant which contains a larger amouut of one element than another may possess a greater power of acquiring it than one which contains a smaller amount."

"The most expensive and irrational system of all, and one more commonly practised than any other in general farming, may be termed the 'hit or miss' system. If a 'hit' is made, there is a profit, if a 'miss' the loss is trifling. In this system no special thought is given to the character of the crop or its needs. If the farmer can afford it, he purchases a fertilizer, without regard to its composition, and applies it in very small amounts. If it happens to contain that element which is particularly needed for the plant to which it is applied, a profit is secured. In too many cases, however, the constituents added are already in abundance in the soil, or so little of the fertilizer is used as to preclude any profit."

"The lacking element cannot be fully determined, except by direct experiments by the farmer himself. That is, no general principle can be depended on as an absolute guide. He should learn whether his soil is deficient in any of the elements, and if so, which one should be applied to the different crops in his rotation. A careful study along this line, too, will show whether it is fertilization that is required to meet seeming deficiencies, for it frequently happens that the needs of the soil are not so much for added plant food as for better management of the soil in other respects."

"The results of field experiments on this place in New Jersey, on reasonably good loamy soils, indicate that phosphoric acid and potash are of much more importance in fertilizers for corn than nitrogen, whereas upon sandy soils nitrogen and potash are of relatively more importance than phosphoric acid; that is, even where extensive practice is used there are conditions where one or more of the elements are not required in order to secure maximum crops, which eliminates the necessity for an immediate outlay for those constituents that are not lacking. Where experiments of this sort have not been carried out and the specific needs determined, it becomes necessary to assume that all of the constituents are required, and to apply the amounts and proportions of those which the general considerations of the soil, season, climate, and crop would seem to demand.

"As already pointed out, the methods of fertilization here suggested, though in many instances apparently positive, are not to be interpreted as absolute rules, but rather used as guides, based upon the best information that it has been possible to obtain, both as a result of scientific inquiry and of practical experience.

"The main point in this whole matter of fertilization is to understand that a fertilizer is a fertilizer because of the kind and form of chemical compound contained in it; and that its best action, other things being equal, is accomplished when the soil possesses good physical qualities, when the

management is also good, and when systematic methods are planned and adopted. 'Hit or Miss' fertilization, may pay, and doubtless on the average does pay as well as some other things that farmers do, but does not pay as well as it might if better methods were used."

With regard to the use of manures therefore, so-called "standard mixtures" should be avoided. The amount of any kind of manure used on any garden should depend on many factors, chief among them being the soil. The above systems, that of George Ville, based on the assumption that for each plant the dominant manurial factor is a plentiful supply of nitrogen, potash, or phosphoric acid; that based on the assumption that in all cases nitrogen should form the chief ingredient of manures, owing to the readiness with which it is removed from the root range of plant by the action of rain water; that based on analysis of plant ash, and finally the "hit or miss" system, totally disregard consideration of the nature of the soil, and the possible interaction of the soil and the manure which is applied to it, and are therefore to be condemned as rational systems of manuring. All systems of manures should be based, as is pointed out in the above quotations, upon actual field experiment on a small scale. The manurial experiment should be planned after a study of chemical and mechanical analyses of the soil, observation of its nature and behaviour during wet and dry weather and of the case or difficulty with which it may be cultivated, and after examination of the subsoil and of the nature of the root range of the bushes. In addition the age and state of the bushes, their appearance and previous treatment should be taken into account. . . . .

We have emphasized elsewhere, however, the way in which the action of manures depends on the soil on which they are used, and therefore the remarks made about the above manures have reference chiefly to the lighter types of soils, such as approximate in character to those of the Heeleaka Experimental Station. Oil-cake and sterilized animal meal will give poorer results, and act much more slowly on soils of heavier type, while on heavy clay soils little or no results are to be expected from their use. Nitrate of soda and sulphate of ammonia must be used with caution, and in small quantities at times, and they will probably not be found to be economical manures in districts where the rainfall is very heavy. The benefit, if there is any, of potash manures on tea soils has yet to be demonstrated. Basic slag and superphosphate are valuable manures, and we are inclined to think that the use of the former will be extended when we are in possession of further data with regard to the types of soil for which it is particularly suited. It should be accompanied by a green crop; general improvement of the health of the bush rather than big increases in outturn of leaf are to be expected to follow its use.

Nitrolim and nitrate of lime have not yet been sufficiently experimented with to have yielded reliable data. Experiments with these on heavier types of soil would be profitable.

Our final word of advice is that the manurial requirements of gardens should be studied by trials of manure over small acreages before using them on a large scale. The first step to take, before this is done is to obtain a chemical mechanical analysis of the soil upon which to base a scheme of Experimental Manuring. The use of so-called standard mixtures should be avoided. The mixture which is best suited to a particular soil should be determined by experiment. Manures should be bought from reputable firms only. All quotations obtained from such firms should be accompanied by a chemical analysis which may be submitted for approval this Department, if necessary. A guarantee that the composition of the bulk of the manure corresponds to that given in the analysis should be insisted upon.

RUBBER.

Manuring of Hevea Rubber.

Tropical Life writes :—

Although the application of manures is a comparatively recent introduction into rubber plantations, experiments have already shown that their judicious use is followed by good results and improved yields. It has been established that when the soil is supplied with a well-balanced plant-food the growth and the vigour of the rubber trees is considerably increased, rendering them at the same time more capable of resisting pests and injuries from other causes. Properly manured young trees allow tapping operations to be commenced six to twelve months earlier, whilst similarly treated old trees show a greater increase in girth and renew their bark more quickly and more thoroughly than the trees grown on unmanured land. Experiments have further shown that owing to the application of manures the flow of latex was more vigorous, and that the coagulation of rubber from this latex took place more promptly. If, on the other hand, it is borne in mind that the fertility of the soil of a plantation is reduced not only by the amount of plant-food removed in the latex, but to a much larger extent by the considerable quantities of fertilizing ingredients which are continuously required for the renovation of the bark, for the growth of new wood, and for the production of leaves and fruit, it is obvious that sooner or later even the richest soil becomes exhausted unless adequately manured. It therefore follows, in the light of the above results, that it is to the advantage of every planter to prevent soil-exhaustion on his plantation, and at the same time to encourage increased yields of rubber.

Unfortunately, on nearly every plantation the production of farmyard manure and compost, even if all the waste is carefully collected, is insufficient to meet the manurial requirements of the plantation. Therefore, in order to maintain or to increase the fertility of the soil, the bulk of, if not all, planters must avail themselves of the use of artificial manures, especially as they can be made up to any formula and so enable the owner or manager to apply just those fertilizing ingredients that are needed.

Nitrogen in a readily available form is supplied by nitrate of soda, nitrate of potash, nitrate of lime, sulphate of ammonia, and calcium cyanamide or nitrolim. Nitrate of soda, nitrate of potash, and nitrate of lime contain nitrogen in the form of nitric acid—which is directly assimilable by the plants—dissolve easily in water, and are not absorbed by the soil. They should therefore be applied in light dressings only, in order to prevent their being washed out of the soil. Nitrate of soda contains 15·5 per cent. and nitrate of lime 13·9 per cent. nitrogen. Nitrate of potash contains 13·5 per cent. nitrogen and 44 per cent. potash, and should—owing to this high percentage of potash—only be used on soils which are deficient in potash. Sulphate of ammonia and calcium cyanamide contain 20 per cent. and 18 per cent. nitrogen respectively, but in such a form that they must undergo a change into nitric acid in the soil before they become an available plant-food. In the Tropics, however, this change takes place very speedily, so that there is scarcely any difference between the effectiveness, nitrogen for nitrogen, of nitrate of soda, nitrate of lime, sulphate of ammonia, and calcium cyanamide. The choice between them is dictated more by the character of the soil and the price of the fertilizers per unit of nitrogen. Whereas calcium cyanamide and nitrate of lime are suitable for all soils, though preferable for those poor in lime, sulphate of ammonia should only be used on soils well provided with lime. Nitrate of soda can be profitably used on almost all soils, excepting light sandy soils, but shows its best effects on loamy soils.

All these nitrogenous manures are quick acting, and their nitrogen will be absorbed by the rubber tree within a short time. The effect of an application of nitrate of soda upon the flow of latex in Ceará trees was manifested within 48 hours (See *Hawaii Bulletin*, No. 16) of their application. It will therefore be advisable to meet the continuous requirements of the rubber tree in nitrogen by applying a portion of what is required by means of some less quickly available manure, such as oil cake, or blood meal.

The best known phosphatic manures are superphosphates and Thomas' phosphate powder or Basic slag.

The manurial value of the superphosphates (ordinary and concentrated) depends upon their content of phosphoric acid soluble in water and in citrate of ammonia solution. Whereas the percentage of water-soluble phosphoric acid ranges from 12 to 20 per cent. in ordinary superphosphates, the concentrated superphosphates contain 40 to 43 per cent. water-soluble phosphoric acid, and 2 to 3 per cent. phosphoric acid soluble in citrate of ammonia solution.

If superphosphate is applied to the soil, its phosphoric acid, being soluble in water, becomes disseminated throughout the soil, and is there absorbed by other soil constituents, as lime, magnesia, iron, and alumina, forming phosphates which are insoluble in water. In soils containing a fair amount of lime the water-soluble phosphoric acid is precipitated into phosphate of lime, which supplies the plants with available phosphoric acid; but on soils poor in lime, the water-soluble phosphoric acid is either subject to being washed out of the surface soil, or is absorbed by the oxides of iron and alumina forming compounds, the phosphoric acid of which the plants can only assimilate with the greatest difficulty. The use of superphosphates should therefore be limited to soils which are not deficient in lime; on these, 1 lb. of phosphoric acid in concentrated superphosphate.

Thomas' phosphate powder, a by-product in the manufacture of steel free from phosphorus, contains 15 to 20 per cent. phosphoric acid, 40 to 50 per cent. lime, and 4 to 5 per cent. magnesia. The phosphoric acid in Thomas' phosphate powder, although insoluble in water, is easily soluble in weak acids, and therefore readily assimilated by plants. In genuine Thomas' phosphate powder 80 per cent. and more of its phosphoric acid is soluble in a 2 per cent. citric acid solution, which portion is considered quite as available as the water-soluble phosphoric acid in superphosphate. As the phosphoric acid in Thomas' phosphate powder does not undergo any changes in the soil which might reduce its availability, the use of this phosphatic fertilizer is not restricted to any particular class of soil, but can be applied with advantage to all soils. Its effects are most marked on soils deficient in lime, and on soils containing an excessive quantity of organic matter, in which cases the effects of the Thomas' phosphate powder are due not only to the phosphoric acid but also the lime it contains. The latter can be easily assimilated by plants, and, like every other form of alkaline lime, improves the mechanical condition of the soil, promotes the oxidation of the nitrogenous reserves, brings the soil potash in solution, and helps to neutralize and render harmless the organic acids of soils rich in humus.

The principal potash manures in use are sulphate of potash and muriate of potash. The former, containing 48 to 52 per cent. potash, is especially recommended for soils deficient in lime, whereas the use of muriate of potash, containing 50 to 59 per cent. potash, is better limited to soils containing an ample supply of lime. The sulphate of potash, being less soluble than the muriate of potash, is better retained by the soil, and in very wet districts, although a little dearer, is a more profitable source of potash than muriate of potash.

If the soil of the plantation is so poor in lime that this deficiency cannot be made good by the continued use of Thomas' phosphate powder as phosphatic manure, the application of burnt lime or ground limestone becomes necessary.

As to the quantities of fertilizing ingredients to be applied to rubber plantations, this depends not only upon the different requirements of the rubber trees at their various agesm but also upon the condition of the soil. For plantations on fair average soils, showing neither a marked excess nor a marked deficiency in either of the three fertilizing ingredients—nitrogen, phosphoric acid, and potash—the supply of plant-food may be considered as well balanced if these fertilizing ingredients are applied in the proportion of 1 part nitrogen, 1 to 1·5 parts phosphoric acid, and 1.5 to 2 parts potash; and, therefore, for trees old enough to be tapped, which require about 40 lbs. nitrogen, 60 lbs. phosphoric acid, and 70 lbs. potash per acre, the following mixture may be safely recommended to ensure good results:—

$1\frac{1}{2}$ cwt. nitrate of soda (or $1\frac{1}{8}$ cwt. sulphate of ammonia.)
$1\frac{1}{2}$ cwt. oil cake.
$3\frac{1}{2}$ cwt. Thomas' phosphate powder (or $1\frac{1}{2}$ cwt. concentrated superphosphate).
$1\frac{1}{4}$ cwt. muriate of potash.

All these manures may be mixed together, with the exception of Thomas' phosphate powder and sulphate of ammonia.

Where, however, plantations are laid out on poor soils, the above quantities should be increased by one half—and a similar increase is advisable as regards the potash supply on light soils, whereas on strong soils—which are, as a rule, poor in phosphoric acid and lime—5 cwt. Thomas' phosphate powder per acre will meet the requirements of the rubber tree better than either of the phosphatic dressings suggested above. Furthermore, if the trees show a good leaf growth, the nitrogenous dressing may be decreased by one-third, whereas if the leaf growth is weakly, better results will be obtained by increasing the nitrogen supply one-third.

As to the manuring of young plantations, the planter will be well advised to make use of the nitrogen collecting power of leguminous plants, which grown between the rows, and forked in when they are in flower, are able to meet the young rubber trees' requirements of nitrogen. In order to enable the leguminous plants to develop vigorously, and to accumulate an increased quantity of nitrogen, it is, of course, necessary to manure same with phosphoric acid and potash, say, 2 to 3 cwt. Thomas' phosphate powder, and $\frac{1}{2}$ to $\frac{3}{4}$ cwt. muriate of potash per acre. Such "green manuring" may be practised as long as the growth of the leguminous plants does not hinder the roots of the rubber trees in their proper development.

When, however, green manuring is not adopted, the nitrogen has to be applied by means of artificial manures. Young trees should receive, during the first year, a manuring with $\frac{3}{4}$ oz. of nitrate of soda, $\frac{3}{8}$ oz. oil cake, $1\frac{1}{4}$ oz. Thomas' phosphate powder, or $\frac{1}{2}$ oz. concentrated superphosphate, and $\frac{3}{8}$ oz. muriate of potash per tree, these quantities to be doubled from year to year till the trees are fit for tapping, when the full manuring suggested above may be adopted annually.

The artificial manures are to be sprinkled around the trees. Until the young trees reach their fifth or sixth year, it is a better practice to manure them singly, by distributing and forking in the manures around the stem at a distance of from 1 to $1\frac{1}{4}$ ft. for each year of the tree's growth. After the sixth year the soil of a plantation is so thoroughly permeated by the roots of

the trees that the artificial manures can be distributed over the whole plantation.

Prospects of Rubber Plantations in the Kasai District (Congo State).

The following information is from a report by H. M. Vice-Consul for the Kasai District (Mr. E. W. Thurstan) on rubber plantations in that district (see also "*Board of Trade Journal*" of 18th May, pp. 358-9) :—

Rubber plantations have been in existence for some years in the Kasai District, which at present produces a large proportion of the wild rubber exported from the Congo. These plantations are, however, few in number, and apparently unprofitable. There have been various reasons for this; there was, for instance, a lack of experience and expert knowledge, and experiments were made with many varieties of rubber trees, resulting too often in their being cut down on reaching maturity or being destroyed by tropical storms. The period of experiment is now considered ended, and it is considered established that the *hevea* (Pará) is the most suitable tree for plantation is the Kasai.

The soil and climate of this district seem to be admirably adapted for rubber plantations. The banks of the main Kasai River, immediately above its confluence with the Lulua, would seem to be the most suitable locality. This some 5 degrees south of the Equator and about 1,500 feet above sea level, and the climate, though by no means healthy, is better and somewhat cooler than that of the coast. The rainfall, amounting to 60 or 70 inches per annum, is spread over the months September to May. The soil is a light clay, and is covered with virgin forest. The Kasai River is navigable all the year for steamers of 70 or 80 tons from Stanley Pool up to this locality. Luebo, a town of some 14,000 inhabitants, and the best labour-recruiting centre in the district, is within reasonable distance, and there should be no difficulty in securing an adequate supply of native workmen, who, now that Belgium currency has been introduced, receive about 5 francs (4*s.*) a month in wages. The price of land has been fixed by the Belgian Government, at 10 francs per hectare (about 3*s.* 3*d.* per acre) if purchased, or at 5 per cent. of the sale price if rented. To obtain full rights of ownership in or to rent land at these prices, an applicant must occupy it provisionally for five years, meanwhile paying a rent equivalent to 5 per cent. per annum of the purchase price. At the end of five years land thus occupied provisionally and developed will be sold or let to the occupant at the above-mentioned prices if it is planted with trees to the extent of fifteen trees per hectare, or covered to the extent of 1/10th by buildings. In cases where land is rented from the Government the lease is for a maximum period of fifteen years, renewable at will at prevailing prices. The above regulations, do not, of course, apply to plantations already in existence and belonging to private companies or individuals.

The greatest difficulty in the way of making rubber plantations in the Kasai District profitable is that of transport. The confluence of the Kasai and Lulua Rivers is some 800 or 900 miles above Stanley Pool, whence all goods are conveyed by rail to Matadi at the head of navigation for outgoing steamers. Freight, handling and insurance by river, rail and sea to Antwerp would amount to least 1·13 francs per kilogram, and added to this is an export duty of 60 centimes per kilogram, making 1·73 francs per kilogram (nearly 8*d.* per lb.) for the bare cost of landing rubber on the quay at Antwerp. Apart from this, working expenses would necessarily be heavy in such a remotely situated and unhealthy country as the Kasai.

A sample of crude rubber from the Kasai District may be seen by British firms at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E. C.

The Planters' Chronicle.

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Resignation of the Chairman.

In a letter dated the 1st instant Mr. C. H. Brock wrote to the Secretary as follows :—

> " I very much regret to inform you that the directors of the Company I am working for have requested me to resign the Chairmanship of the U. P. A. S. I.
>
> " I therefore request you will be so good as to notify Councillors of my resignation.
>
> " There being now neither Chairman nor Vice-Chairman, I can only suggest that our Planting Member, the Hon'ble Mr. J. G. Hamilton, be asked to kindly act as Chairman pending the election of office-bearers at the General Meeting."

Two changes of Chairman in the course of one year establishes a record which, it is to be hoped, will hold good for many years to come. The resignation announced here means a slight temporary dislocation of work but, also, a serious loss to the Association, not only in that the U. P. A. ceases to have the use of Mr. Brock's valuable services as its Chairman, but because that gentleman will not be able to attend the next Annual Meeting as a delegate. Moreover, he had kindly undertaken to arrive early, in order to superintend all arrangements in connection with the U. P. A. S. I. Exhibition. This he will now be unable to do.

District Associations might consider the expediency of electing in future a reserve man, or "understudy", to assume the Vice-Chairmanship, and even the Chairmanship, in case of emergency. Experience has shown that circumstances may arise to make this course advisable.

Proposed Half-Yearly Meetings.

The North Mysore Planters' Association has given notice of an important resolution, to be moved at the next Annual Meeting of the U. P. A. S. I., *viz* :—

> " That as in the opinion of this Association the long intervals between the meetings of the U.P.A.S.I. result in a loss of interest and knowledge in current subjects, and with a view to expediting the transaction of business of importance, it is desirable that half-yearly meetings should be held."

This subject can, perhaps, be most conveniently discussed under the head of " Rules of the U. P. A. S. I.," as these rules now provide only for *annual* meetings.

Scientific Officer's Papers.

LXIX.—Arsenite of Soda as a Weed Killer.

In Tropical Agriculture the business of keeping down weeds is a big one, and estates which adopt the clean weeding system find that their weeding bill is a considerable item in the annual expenditure. Even when the more scientific practice of keeping down weeds by means of a cover crop is adopted, the natural weeds are a nuisance and require constant attention to ensure that they do not get out of hand.

In past years a great many experiments have been made with chemical sprays to kill weeds. These have proved successful where all vegetation was to be killed, and in America it is the practice to keep railways and road sides clear of weeds by spraying them with some chemical which destroys vegetation. When using such sprays on the weeds in a cultivated area the difficulty is to find a spray which will not injure the crop while it kills the weeds. Writing on this subject in the *Tropical Agriculturist* in June 1909, Mr. Petch said:

"When arsenical compounds were first introduced as insecticides and weed-killers, doubts were expressed that the continual addition of these compounds to the soil would result in injuries to the roots of the plants, and that the soil would become incapable of growing further crops owing to the accumulation of poisons. Experiments in this direction, however, indicated that practically no danger was to be feared since the arsenic became insoluble in the soil and passed downwards to a very little distance. More recently, owing to extensive injuries to fruit trees in Colorado, which were attributed to arsenical and lead poisoning from the use of calcium arsenite and lead arsenate for the control of insect pests, the subject has again been investigated by W. P. Headden, of the Colorado Experiment Station. He finds that arsenical poisons have accumulated in the soil of the orchards to a large extent, and that, while most of the arsenic is in an insoluble form, the sodium salts of the soil, *e.g.*, sodium carbonate, sodium sulphate, and sodium chloride, have rendered so much of it soluble that it has exceeded the limit of danger. It is thought that systematic poisoning may occur through the absorption of this soluble arsenic by the roots of the trees, since the wood in extreme cases contains over twelve parts of arsenic per million, but the chief effect is attributed to local irritant poisoning at the collar. The affected trees are girdled at the collar, the bark on portions of the trunk dead and sunken, and most of the roots dead, their bark destroyed, and the wood discoloured. The first marked symptom is an early ripening of the foliage, usually followed by the death of the tree about midsummer in the following year. Experiments with soluble arsenical compounds showed that these would produce all the effects noted, and the arsenic in arsenate of lime was found to be more readily brought into solution than that of lead arsenate. While the above investigation refers to effects produced by prolonged application of insoluble arsenates which are only slowly rendered soluble in the soil, and the effect of a single such application might be negligible, it may be pointed out that 'weed-killers' are soluble arsenical compounds and take effect immediately. It is extremely doubtful, therefore, whether arsenical weed-killers can be used with safety in permanent cultivations."

Just recently, however, Mr. Wilcox, the Special Agent in Charge of the Hawaii Agricultural Experiment Station, has brought the matter forward again in a Bulletin (No. 30) entitled "Killing Weeds with Arsenite of Soda," in which he describes the success of experiments in the Rubber Estates in Hawaii with the use of chemical weed-killers.

Mr. Wilcox gives the following instructions for preparing the spray: —

"In preparing arsenite of soda we have had good results from boiling a mixture of one pound white arsenic and two pounds sal soda per gallon of water for from 15 to 20 minutes. The exact length of time to continue the boiling cannot be stated beforehand with any certainty but the boiling should be continued until the solution becomes clear. The clearing of the solution indicates that the proper chemical combination has taken place. In Australia, where arsenite of soda has been widely used for killing weeds, the common practice is to buy the arsenite of soda as such on the market, but in the spraying thus far done in Hawaii with arsenite of soda, it has been prepared by boiling white arsenic and sal soda as just described. The stock solution obtained by boiling together the sal soda and white arsenic is to be diluted before spraying with 15 to 24 parts of water, depending on the hardiness of the weeds to be destroyed."

A single application of Arsenite of Soda at the rate of 100 gallons per acre appears to kill a large number of weeds by contact with the leaves. "In spraying with Arsenite of Soda it should be remembered that the effect is produced by contact with the aerial portions of the plant. The spray should be applied in the form of a fine mist so as merely to cover the surface of the leaves and the stems. Care should be exercised not to drench the plants, since no more effect would be thus obtained, and the risk would be run of introducing too much arsenic into the soil."

When considering the possible danger from the use of Arsenite of Soda, Mr. Wilcox says, "The most extensive study of the effect of absorption of arsenic upon plants has been carried out by Headden. Many fruit trees, both apple and pear, were observed to be in a sickly condition, or dying, in the orchards of Colorado which had received arsenical sprays for from 20 to 40 years. An examination of the soil under such trees showed the presence of arsenic in varying quantities, the highest being 138 parts per million. In some cases where sickness or death of the trees was observed the arsenic content of the soil was at least ten times that of normal soils in that locality. The orchardists were found to have been applying for years what must be considered as excessive amounts of arsenic. In some cases as much as 0·9 of a pound per tree. In a period of six years this would amount to 432 pounds per acre or about 108 parts per million in the first foot of soil. The first symptom of poisoning in the orchard trees was a premature yellowing of the leaves. If the application of the arsenicals was repeated the next year the trees died the second year. Serious injuries were also produced in these orchards from the corrosive effect of the arsenic which ran down the the trunks of the trees. The bad effects were most noticeable at the collar of the trunk near the surface of the ground.

"In view of the somewhat divergent opinions which have thus far been expressed relative to the effect of arsenic upon plants, we may well inquire what may be considered the outlook from the continued use of arsenite of soda as a weed destroyer in Hawaii. The results announced by Headden and referred to above have been called in question by other writers but without substantial evidence to disprove his position. Our experience in Hawaii is of only two years' duration. In a letter from Mr. W. A. Anderson of Nahiku, Maui, the following statement is made on the point under consideration:—

"As you know, we have been using the spray for nearly two years "now, in quantities, and have not been able yet to observe any "injurious effects on the trees. Where it has been applied "frequently enough to keep the ground in a measure free from

"weeds, a marked improvement is noticed in the appearance of "the soil, as I suppose might be expected from exposing it to the "air."

"In applying the arsenite spray on the rubber plantation of the Pacific Development Company a cosiderable quantity of the solution was accidentally upset near two rubber trees and the leaves fell from these trees within two days, apparently from the poisonous effects of the arsenite. The trees, however, are recovering.

"The conditions under which arsenite of soda has been applied in Hawaii differ greatly from those which prevail in apple orchards in Colorado. In the first place we are applying only five pounds of arsenic per acre, and to soils which normally contain no arsenic. Then, too, the rainfall in Rubber plantations is very high (160 to 200 inches per year). In the spraying experiments in the Colorado apple orchards the most insoluble form of arsenic was used. When washed down into the soil it, therefore, remains for a long time, gradually becoming soluble and being absorbed by the roots of the trees. Arsenite of soda is an extremely soluble form of arsenic. It is not known whether a considerable quantity of the arsenite of soda may subsequently be fixed in the soil by interaction with other chemical found in the soil. The soils in the rubber plantations, however, are extremely porous and are under-laid with a-a to such an extent that running streams are rare. It is highly probable, therefore, that the most of the arsenite of soda washed into the soil by rains is carried away by the water passing through the soil. It seems very doubtful whether any serious accumulation of arsenic can take place in the soils of the rubber plantations so long as the conditions remain as at present. It can not be questioned, however, that arsenic in excessive quantities in the soil is injurious to nearly all forms of vegetation, and, therefore, some care should be observed in not using unnecessarily large quantities of the arsenical spray. No harmful results have thus far been observed upon rubber or other cultivated plants in Hawaii from arsenicals and it is not likely that harm will result, at least in porous soils such as prevail in rubber plantations, particularly with the very small quantities of arsenic which are being used."

Thus then the matter stands, and what is needed is a few carefully conducted experiments with this spray in Southern India. Will anyone risk a few trees and conduct such an experiment?

In view of the fact that *Lantana* and *Mimosa pudica* are rapidly over-running large tracts of valuable grazing land, and that in Coorg the Government have instituted a campaign against these weeds, it is of interest to note what Mr. Wilcox has to say about the effect of Arsenite of Soda on the former. He reports that, "the leaves and small stems of *Lantana* were destroyed by a single application, but for the complete destruction of the plant a second, third, or even fourth, treatment was found necessary." Mr. Anderson, the Manager of the Nahiku Rubber Co., says, "In a complete list of the plants affected, *Lantana* could not be omitted, as it burns the leaves off, and I have in mind a patch treated over a year ago which has not grown yet. It is unquestionably safe to say that *Lantana* can be kept in check with it, the fact having been demonstrated that the growth above ground can be killed, the conclusion would be natural that by keeping at it the roots in time might be starved out."

In conclusion, Mr. Wilcox says:—

"The chemical method for the destruction of weeds as described in this bulletin is capable of much wider application, particularly for killing weeds along roadways and in waste places where cultivation is at present out of

the question. It should, of course, be remembered that the arsenite is poisonous and stock animals should not be allowed to browse upon sprayed vegetation until after sufficient rain has fallen to wash off what may remain on the foliage. As a rule the effect of the spray begins to be manifested within a few hours in the withering and browning in the leaves of sprayed plants. They are thus rendered unpalatable as food for animals. The spray must remain in contact with the foliage for at least two hours, in order to have the desired effect. In applying arsenite, therefore, a clear day should be chosen, or at least one in which it is not likely to rain soon after the application of the spray."

I have experimented with the spray prepared as directed and diluted twenty times, and that it is immediately effective there is no doubt. A *Lantana* bush, a patch of grass and rough weeds by a road side, and a patch of *Tephrosia* were sprayed with one application of the mixture. At the end of 24 hours the *Lantana* leaves had wilted and shrivelled, the grass and rough weeds had begun to dry up, and the *Tephrosia* was dead. Three days after the application, examination showed the *Lantana* leaves to be black and dry and the young branches dead, while the road-side weeds were black and dry and mostly dead. The patches will be kept under observation to note to what extent they will recover.

The total cost of a single application, including materisls and labour, is given as varying from $1·25 to $2·25 per acre (Rs.3·9 to Rs.7·03). The flowers and foliage of most weeds are destroyed by a single application, thus preventing them seeding and spreading, and in the case of many weeds the roots are destroyed by the first application, about 100 gallons of the diluted spray being sufficient for an acre of ground.

In Bangalore, Washing Soda costs 4 as. per pound, and White Arsenic 12 as. per pound, so that the cost of 100 gallons of the diluted spray is Rs.8-12. : cost of preparation and application must be added to this. If large quantities are bought it will no doubt prove cheaper. The spray can be applied from a barrel sprayer on level land, and from Knapsack sprayers, which hold about 5 gallons, and are carried on a cooly's back, on uneven ground.

RUDOLPH D. ANSTEAD,
Planting Expert.

Writing on June 7th, 1911, the Hamburg correspondent of the *Economist* remarked :—Stocks [Coffee] here are being reduced, despite liberal arrivals. The demand continues urgent, and the high prices asked are readily paid, thus proving reserve supplies. The decrease in the visible supply is double what it was a year ago. Cost and freight offers are being advanced without checking the purchasing by leading distributers. Stocks in the Santos market are reduced well below 1,000,000 bags, and receipts at that port are small, even compared with last year. The market is going through a period of rest--nothing more ; its strong position will be demonstrated more clearly from month to month. Thus the optimist. And it must be acknowledged that the bear operator has little to say for himself at the moment. He relies more on the future developments than the actual situation, maintains that the Brazilian crop which is now beginning to be marketed will prove much more than 13,000,000 bags, which are predicted as maximum figures, and so on. And the outsider, finding the arguments for high prices more plausible, and the reasons given for their probable maintenance more tangible, is inclined to follow the lead that for nearly a twelve month past has proved itself successful.

Notes and Comments by the Scientific Officer.

115. *Loss of Lime from the Soil.*—The Lime in soils is subject to a regular loss owing to the Carbonic Acid present in rain water, and also that which is constantly being formed in the soil itself, dissolving it so that it is removed in the drain water. This loss is increased by the constant use of fertilisers like Sulphate of Ammonia, and low grade acid Superphosphates, and diminished by the use of fertilisers like Nitrate of Soda, Basic Slag, Cattle Manure, and Green Manures. The normal growth of crops tends to restore a certain amount of Lime to the Soil, the ash of leaves containing a high percentage of it. The mulch produced by the shade trees in Coffee is valuable in this respect. Dr. Lehmann, in his Annual Report for 1901-2, gave the following percentages of Lime as being contained in the fallen leaves of the species of shade tree quoted :—

Ficus glomerata (Attee)	5·57%
Ficus (Mullay Gerguttee)	4·45%
Ficus Mysorensis (Gonee)	5·29%
Ficus infectoria (Kare Busree) ...	5·11%
Ficus (Cub-Busree)	3·01%
Artocarpus integrifolia (Jack) ...	2·77%
Dalbergia latifolia (Beete)	1·77%

Much of this Lime is drawn from the subsoil by the deep roots of these trees and is added to the top soil where it can be of use to the Coffee, but despite this there is very little Lime in most of the Coffee soils and everything possible should be done to conserve it by the use of alkaline instead of acid manures, while regular systematic liming at intervals of three to five years should be adopted.

116. *Experiment Plots.*—At the Annual Meeting of the U.P.A.S.I. held in 1910 it was decided to establish Experiment Plots in the various districts on which investigations in manuring and other matters could be carried out. An account of the proposed scheme will be found in the *Planters' Chronicle*, Vol. V, p. 373. Local Committees were elected in the various districts to take charge of, and organise, these experiments, and in many districts work has been begun. I wish to compile a list of these Plots for my 1911 Annual Report and have asked the Honorary Secretaries of the District Planters' Associations to obtain information for me as soon as possible showing what Plots are established, what experiments are actually being conducted, and when the first results are likely to become available. I should be glad if planters who are conducting experiments on their estates would be good enough to send this information at once to their District Association Secretary so that he may compile a list to be sent to me at an early date. I note with the greatest satisfaction that a public spirited planter in the Wynaad has offered the sum of Rs.300 annually for the purpose of investigating the Pepper Vine Disease, and I trust that this generous offer will be taken up in the way it deserves.

117. *Ammonia for Ceará Tapping.*—In my lecture delivered at Yercaud on 31st January, I said that I was trying to make arrangements to have Ammonia put up into stoppered bottles in a cheap and handy form for use on the estates. Messrs. Irwin Monro & Co., Bangalore, now write to inform me that they can supply ·880 Ammonia at 9 annas per pound in one pound bottles, the bottles extra, or in drums containing 50 lbs. at 8½ annas per pound. The drums will be charged for at the rate of Rs.5 per drum which will be refunded if the drums are returned in good condition. The same firm also inform me that they can supply glacial acetic acid for coagulation purposes at very favourable rates.

RUDOLPH D. ANSTEAD, *Planting Expert.*

CEYLON ASSOCIATION IN LONDON.

ANNUAL MEETING.

The report of the executive committee of the Ceylon Association in London for the year 1910-1911, laid before the twenty-third annual general meeting on 15th June, 1911, states *inter alia*:—

For the first time in the history of the Association the number of members exceeds 200, the number on the roll being now 210, as against 179 last year.

The committee records with regret the deaths during the year of Mr. R. Porter, well known as a planter, and of Mr. F. S. Long, a member of the tea and produce committee.

A parting gift of £25 was made to Mr. R. A. Kendall in recognition of his services in assisting the secretary from the formation of the Association in 1888 till January last, when he obtained other employment.

The Ceylon Chamber of Commerce has generously agreed to increase its annual contribution to the funds of the Association from £50 to £100.

The prosperity of Ceylon agriculture has been well maintained. The tea industry is in a very sound position, while rubber is yielding handsome returns.

In view of the constantly increasing demand for labour it is satisfactory to be able to announce that the Ceylon Proprietors' Labour Federation, mentioned in last year's report, has now been formed on lines recommended by a special committee of this Association appointed in September last. The special committee made a further recommendation that an assessment rate per acre be levied for establishing coast agencies in new districts on an extended scale. In accordance with this recommendation the Planters' Association, at their annual meeting in February, resolved to increase the contribution to the coast agency from 15 cents to 30 cents per acre.

It is to be hoped that these measures may be effective both in mitigating the evils of the advance system and in maintaining an adequate labour supply in the planting districts, and it is much to be regretted that at this juncture the Secretary of State, acting in opposition to the advice of His Excellency the Governor, should have instructed him to discontinue the contribution of 25 per cent. made by the Government since 1904 towards the cost of the coast agency.

In last year's report it was anticipated, in view of statements made by the chairman of the London Port Authority, that the charge on tea imported would be fixed at 1*s*. 8*d*., on coffee, and cocoa at 9*d*., and on rubber at 2*s*. 6*d*. per ton. Much disappointment was felt when the pubiished figures were found to be 2*s*. 3*d*., 1*s*., and 3*s*. 4*d*. per ton respectively. Your committee joined with the Indian Tea Association and Tea Buyers' Association in an unvailing protest against the unexpectedly high rates.

A sub-committee has been appointed to act, with gentlemen nominated in Ceylon, in making arrangements for the International Rubber Exhibition at the Agricultural Hall.

Mr. G. F. Walker and Mr. C. E. Welldon have joined the committee during the year.

In the course of his address the Chairman, Mr. C. J. Scott, said:—

"Tea, rubber, coconuts, cocoa, and the minor products are, I believe, all in a flourishing condition, and to keep pace with this prosperity the Govern-

ment should push forward railway communications, and all possible means should be adopted by the Government and those interested in estates, by the Labour Federation, and by Recruiting Agencies and other means, to increase the efficiency of the labour force."

Mr. J. L. Shand remarked:—

"I would, first of all, congratulate myself and all other old colonists on the wonderful era of prosperity which has set in in Ceylon. (Applause.) The great tea and coconut enterprises are on a basis of prosperity at present which seems likely to continue, and the rubber enterprise, soon to become very great, is in a sound condition. (Applause.) True, the famine price at which rubber was sold a year ago created an inflation which must have, in some cases, led to disappointment; but it is only the vendor of patent medicines who can expect to sell his wares for ten times as much as they cost him to produce. (Laughter.) If we can sell our rubber at double the cost of production, which is a certainty, it will be a splendid enterprise; and, if we can sell it for treble the cost of production, which is quite likely, it will be a magnificent investment. (Hear, hear.) The labour difficulty, which we always have with us, still gives much anxiety, but I am very hopeful that the efforts of the Labour Federation will lead, to some extent, to a solution of the difficulty. (Hear, hear.) When I was last in Ceylon I went over many estates, and on all of them there seemed to be an ample supply of coolies in the lines if they could only be got to turn out to work. But there is a restlessness abroad, caused in great measure by coolies moving about from one estate to the other, which I think has been much in the way of steady work; coolies being like children—if they are restless they cannot settle down. But I am hopeful that, when neighbours cease to take on neighbours' coolies, with the teeming millions which we have in Southern India, the extra 100,000 or even 200,000 which may be required in Ceylon may be forthcoming. (Hear, hear.) The circumstances of life in Ceylon are very much superior to those under which the cooly lives in his own country, and a good day's wage is obtainable for an easy day's work."

Mr. Scott was re-elected Chairman, and Mr. W. Martin Leake, Secretary.

The Tea Trade in London.

The tea market remains in an unsatisfactory state from the buyer's point of view observes the *Grocer* (June 3). Common leaf grades continue at an awkward price, about $7\frac{3}{4}d.$ to $8d.$, with very little to be bought at $7\frac{3}{4}d.$, and values are $1d$, per lb. higher than at this time last year. There are lower prices for common Indian sorts, but such are only for red, rough and stalky descriptions, which are little wanted, and are usually associated with the closing down of the crop. There seems to be no immediate prospect of any modification of the present anomalous position of common tea, which is in far too small supply for general requirements. The price is still abnormally high, and the sale of low-grade tea is an unremunerative business. Some members of the trade hold the view that it might be better if common leaf became still dearer, so as to restrict the outlet for these descriptions, and drive the demand on to the finer sorts. At the present time the better qualities offer exceptionally good value, and their sale is worth pushing. The better grades should realize considerably more money than common, but in such a market as now obtains, they are being sold materially below their value. The demand is very strong up to $9d.$, over that figure teas do not always receive the attention they deserve. The opinion has been expressed that the high prices of the lower grades are causing less tea to be consumed.

CORRESPONDENCE.

District Association Proceedings.

Sir,—I have not yet seen the minutes of the last Nilgiri Planters' Association meeting. I think it is a pity these meetings are not *always* reported. When Mr. Anstead was in our district we wished to turn up a certain resolution but found the meeting had never been reported. The last meeting was, I believe, a very important one, and for the information of those unable to attend, and for reference, I think the minutes should, as they sometimes are, be given in your paper.

30—6—1911. KOTAGIRI.

The Tea Brokers' Combine.

HAMBURG AS A MARKET.

Sir,—With reference to the Tea Brokers' combine lately started in London to try and reduce the price of tea at the auctions, it behoves planters in all branches of the industry to work for new markets.

I have been in correspondence with the head of a firm in Hamburg for some time past. He proposed that I should send him samples of tea, coffee, etc., for him to make offers for. I did so and he obtained very satisfactory prices, so much so that I intend to ship to him in future instead of to London.

Tea.—He tells me that the large German buyers buy from London, through the large buyers there. The tea has then to be reshipped to Germany, which of course means, (1) London Brokers' commission, (2) Buyers' commission, and (3) double dock and shipping charges, before it lands in Germany.

He suggests that planters wishing to give the Hamburg market a trial should send him a small lot of 2,000 to 4,000 lbs. of tea or other produce while the balance of the break is sent on to the market. He requires half a dozen samples of the break by post in advance (11 ozs. including weight and packing) as soon as these are received he sells on sample, if possible, so that the produce is handed over when it arrives to the buyer and never enters the auction rooms. The balance of the break being sold in London will enable the planter to see at a glance which market will suit him best. He is willing to get valuations on all raw produce such as oils, coffee, tea, cardomums, etc., but particularly mentions that German buyers of rubber go to London for 'scrap,' etc. Why not let them get it direct ?

If any planter would like to give Hamburg a trial and would put me a few questions I would gladly answer them in this paper for the benefit of all S. I. Planters. Then they could write direct for themselves. I will give the address in my next.

ONE WHO WOULD LIKE TO SEE THE TEA BLENDERS' RING BROKEN UP.

CAMPHOR IN GERMAN EAST AFRICA.

The British Vice-Consul at Leipzig (Mr. R. M. Turner) reports that, according to the *Leipziger Neueste Nachrichten* of 28th May, Herr Lommel, the head of the Biological Station at Amani, German East Africa, has been successful in his attempt to grow camphor in that colony. It is hoped that the colony will be able to produce camphor in sufficient quantity to compete with the exporters from China and Formosa, who at present control the market. It is further stated that a method of obtaining the camphor from the leaves, that is to say, without destroying the trees, has been successfully practised at the Biological Station.

RUBBER.

Utilisation of Para Rubber Seed.

Reference has been made previously in this *Bulletin* to the fact that the kernels of these seeds contain about 42 per cent. of a liquid drying oil very similar in properties to linseed oil and capable like that oil of being used in the manufacture of paints and varnishes, rubber substitutes, oil cloth, soft soap and other important industrial products (this *Bulletin*, 1903, 1. 156; 1904, 2.22; 1909, 7.95). Since these kernels were first investigated at the Imperial Institute in 1902-3, small consignments have heen received from time to time in London and sold as oil seeds, but there has been no large development of this trade, mainly because the demand for seed for planting has been so large as to preclude the collection of seed for industrial use, and, further, the profits from sales of rubber on developed estates have been so large in recent years that little or no attention has been given to the utilisation of by-products. Now, however, when the area of productive Pará rubber plantations is increasing rapidly every year, it seems likely that this indifference to the possibility of using these kernels will disappear, and already the expression of oil from the kernels has been undertaken at one or more mills in the East Indies.

It is opportune, therefore, to call attention to several practical difficulties which may occur in dealing with these kernels, and to methods of overcoming them.

Considerable difference of opinion exists as to the cost of collecting Pará rubber seeds. The late Mr. Carruthers, in his report as Director of Agriculture for the Federated Malaya States in 1908 estimated that 1,000 seeds could be collected there for 4 cents (1·1*d.*), and that 414,400 seeds would be needed to produce 1 ton of kernels. From these data he calculated that the cost of collecting and shelling 1 ton of kernels would be \$21·14 (\$=2*s.* 4*d.*)

This estimate is considered far too low by Messrs. Macmillan and Petch (*Journ. d'Agric. Trop.*, 1910, 10. 284, and *Circulars and Agr. Journ. Roy. Bot. Gard. Ceylon*, 1908, 4·90), who point out that in Ceylon the cost of collecting 1,000 seeds is 4*d.*, and that Mr. Carruthers' estimate of the number of seeds required to produce 1 ton of kernels is based on the weight of seeds from untapped trees. It has been shown in Ceylon that seeds from tapped trees are smaller and lighter than those from untapped trees, at least 700,000 seeds would be needed to produce 1 ton of kernels. Accepting their data, the cost of collecting sufficient seed to produce 1 ton of kernels would be £11 13*s.* 4*d.*, which is certainly a prohibitive price so far as the export of these kernels as an oil seed is concerned. It should be pointed out that Messrs. Macmillan and Petchs' criticism of Mr. Carruthers' estimate is mainly directed to the question of the quantity of seeds required to produce 1 ton of kernels, whereas the principal difference between the two estimates lies in the cost of collection, which appears to be nearly four times as great in Ceylon as in the Federated Malaya States. In this connection it may be mentioned that Mr. Ridley, Director of the Singapore Botanical Gardens, has suggested that the right of seed collection in plantations in the Straits Settlements might be leased to Chinese, who would be able to utilise for this purpose the labour of village children. If this plan is feasible it would appear to afford a comparatively simple solution of the labour difficulty in Malaya.

For shelling the seeds, the installation of machinery is desirable. Trials with Miller's nut-cracking machine at the Imperial Institute have shown

that this can be used for the purpose ; but it is necessary that trials on a comparatively large scale with the various machines available should be made before definite recommendations in favour of any one make are made. It is essential that the machine adopted should crack the shells without damaging the kernels, since the latter deteriorate somewhat rapidly when they are broken and exposed to air. This is of small importance when the kernels are to be utilised locally and at once for the expression of oil, but it becomes all-important if the kernels are to be exported as such.

Kernels for export should be thoroughly dried in the sun before being packed in bags for shipment. When these precautions are taken it is quite clear that the kernels can be shipped to Europe, and will arrive in sound condition. In 1909 a small experimental shipment was made to this country from Ceylon, and, as pointed out in this *Bulletin* (1909, 7. 95), it behaved quite satisfactorily on expression and furnished oil of excellent quality. This year a further small shipment of kernels was received at Liverpool, and a sample of these, kindly supplied to the Imperial Institute by the purchasers, was found to be in good condition, and to give a normal yield of oil of good quality.

In expressing Pará rubber seed oil trouble may arise from the presence of a fat-splitting enzyme in the kernels, as this is taken out with the water expressed along with the oil, and if this aqueous layer is left in contact with the oil, the latter will be rapidly hydrolysed into glycerine and fatty acids. A similar fat-splitting enzyme, however, occurs in castor seed, and this occasions no difficulty in the industrial preparation of castor oil (see p. 31), and it may be assumed that with due care no trouble will arise with Pará rubber seed kernels from this cause.

In determining the value of an oil seed the amount of oil present is the factor of prime importance, but much also depends on the nature of the cake left after expression of the oil. If this contains no deleterious ingredients, and is rich in nutritive materials and poor in indigestible fibre, it can be used as a feeding-stuff for cattle, but if deleterious ingredients, are present the material can, as a rule, only be employed as a manure. Unfortunately Pará rubber seed kernels contain a cyanogenetic glucoside and an enzyme which decomposes this in presence of water, yielding prussic acid, as one product. This, however, is also true of linseed cake, perhaps the most popular feeding-stuff with farmers in this country at the present time, so that, as has been pointed out already in this *Bulletin* (1905, 3. 373 ; 1908, 6. 210), the mere production of small quantities of prussic acid affords no ground for suggesting that cake from Pará rubber seed kernels will be unsuitable for feeding cattle. It is, however, of the greatest importance to determine as soon as possible what the average maximum yield of prussic acid from cake made from these kernels under industrial conditions is, and if this proves to be no larger than that obtained from linseed cake on the average, it may be assumed that the cake is worth trial as a feeding-stuff. With all new feeding-stuffs it is desirable that extensive preliminary feeding trials should be made before the material is placed on the market, and even should Pará rubber seed cake, prove to yield less prussic acid than average linseed cake, it will still be indispensable that preliminary feeding trials should be made with it.

Recently a detailed examination of Pará rubber seed oil has been made by Dr. S. S. Pickles in the Scientific and Technical Department of the Imperial Institute, and the results will be published shortly. The results show that the oil consists of a mixture of glycerides of linolenic, linoleic, oleic, and stearic acids, with possibly some palmitic acid.

The proportion of unsaturated acids present is lower than in linseed oil, as was to be expected from the slower "drying" character shown by Pará rubber seed oil.—*Bulletin of the Imperial Institute.*

Tackiness in Rubber.

Dr. Fritz Frank has written the following for the *India-Rubber Journal*:—

On page 12 of *The India-Rubber Journal* of May 20th of this year, an article appears under the above title, giving the views held at present as to the reasons for rubber becoming tacky. This extremely valuable statement gives an excellent review of all that has been actually done in this most important field, and of the conclusions that have been drawn from investigations upon the subject. The great importance of bacteriological action is discussed, and it is stated that rubber which has been obtained from the latex of trees tapped for the first time is more liable to become tacky. Whether tackiness can be directly due to bacteriological action therefore appears to me doubtful, because really uncut trees afford the least opportunity for the presence of bacteria. It appears much more likely to me that the high content of albumins and the large amount of foreign bodies present must constitute important grounds for explaining why the rubber becomes tacky.

An hypothetical explanation I put forward some time ago is criticised in the article in question, and I am required to bring proof that polymerisation of the rubber actually occurs during coagulation. To bring positive and direct experimental proof of this is, I maintain, extremely difficult, although not impossible. Indirectly, however, a certain further support for my opinion is afforded by investigations carried out in the meantime. These investigations by Marckwald and myself, relating in one instance to East African plantation rubber, and in another to Kickxia (Funtumia) rubber, reports upon which have been published in the "Gummi Zeitung." (25th year, Part II., No. 24), have shown that those rubbers which coagulated quickly from the latex with very active coagulating media, were invariably the best and technically the most valuable, and were not at all, or only in the smallest degree, inclined to become tacky. Of the Manihot rubbers those which were obtained from the flowing latex on the tree with concentrated lemon juice proved by far the best in every way, whilst with Kickxia rubber those had the greatest nerve which were quickly and thoroughly coagulated by the application of heat, the latex at the same time being strongly diluted. In the latter cases it was quite immaterial what kind of coagulating medium was used. Even sulphuric acid, which for example, Spence maintains is an agent specially inclined to cause tackiness, had no injurious effect. The results of this work have been therefore to support my theory strongly, and I find from fresh observations not yet published, a further indirect support for my theory, in that Manihot latex, when it has been obtained in a fluid state by dilution according to the Bamber-Sandmann process, yields nervy rubbers, which do not become tacky when the latex is allowed to flow into dilute purub-liquid, in which it immediately coagulates to an exceedingly solid and nervy mass.

Since the first publication of my theory, I have derived support on one point from Spence's work, although of course I place a different construction upon the result of his work than he does himself. Thus, in his experiments, he allowed the rubber latex to stand for a long time at a moderate temperature in an oven, with small quantities of sulphuric acid, and afterwards he was only able to separate the rubber as a sticky mass. This to my mind must be taken as a proof for my hypothesis. Here is a typical case of rubber becoming tacky,

in which bacterial action is absolutely excluded. I have proved that the sulphuric acid cannot have been the cause of the tackiness in this case by previous experiments, carried out on the large scale in the Colonies and here with Kickxia latex. As already stated, Kickxia rubber coagulated in the correct way with sulphuric acid, has the same good properties as are obtained with other chemicals. Another cause must therefore be sought for the results of Spence's test, and I find it in the conditions governing Spence's work, which were such as to solidify the rubber in a small degree only. The solidification, however, according to our present knowledge of the subject, appears to be dependent upon the size of the molecule with reference to the place in which the colloid occurs. The molecule is, however, the expression for a high degree of polymerisation, therefore my construction of Spence's work appears to me to have a large degree of probability, and to be a valuable additional support for my theory.

Bark and Yields.

Our readers will now have an opportunity of digesting the annual reports, and speeches made at the general meetings, of several leading plantation companies in the East. The General meetings of the Linggi and Lanadron Rubber Companies are of more than usual interest. At these meetings several subjects of great importance to all who are looking forward to constantly increasing supplies from plantations were raised. We have, during the past few months, devoted ourselves specially to a discussion of yields and the methods of tapping at present employed on estates; also to the effect of seasonal and other influences on the periodicity of crops.

Yields Per Acre.

As far back as the Rubber Exhibition 1908, we gave it as our view that an average yield of 300 lbs. per acre per annum could be anticipated from the greater number of estates then planted. This we assumed to be the average result over the whole of the planted acreages, after an allowance had been made of approximately 15 per cent. for areas which would never reach the tapping stage. We explained that this was based on an estimate of about one ton per five acres from the best estates in Malaya and Sumatra, and of one ton per 10 acres in Ceylon, Java and South India. We can recall some adverse criticisms of our views by parties who were so sanguine as to assert that a yield of 500 to 800 lbs. per annum was more likely to be the return in future years. We are now glad to see that after careful thought the directors and managers of Linggi and Lanadron are basing their estimates only on a yield of 300 lbs. to 400 lbs. per acre per annum, and they have been wise enough to see that any annual yields in excess of this amount would involve the destruction of a very large area of bark, an area which, if destroyed would ultimately necessitate the resting of the rubber trees for indefinite periods.

System of Tapping.

We have also constantly advised that a system of tapping under which four years were allowed for renewed bark to mature, was the only safe one to be adopted at the present time. In reference to this point, we know that our advice has not always been followed, and that on many estates the managers have preferred to adopt the third section system, which permits generally of only three years for bark renewal. We have repeatedly tried to impress upon planters and others that "the bark is the mother of rubber," and that if it is excised too rapidly, the source of future supplies is seriously affected. Within limits, it is safe to say that the longer the bark is allowed to remain on the tree, the higher the percentage of caoutchouc in the latex when that bark is tapped. Even such an experienced planter as Mr. Malcolm Cumming stated at the annual meeting of the Linggi Company that though they tried as far as possible to allow the bark three years to renew,

he was not prepared to say that they might not have to leave the trees longer. In this suggestion we see a tendency to follow the recommendations we have made in this journal and to managers of plantations for many years. We do know of one or two estates where the rubber trees grow at an abnormally rapid rate, and where up to the present, three years has appeared to be sufficient for the renewal of bark; but these estates are, in our opinion, quite exceptional, and even here we doubt whether the full effect of tapping renewed bark at three years can be ascertained at the present time. It is not as though we intended tapping the trees for the next three years only; we tap them on a system which means that we shall have to annually cut away very large areas of bark for each of the next 20 or even 30 years. Hence the necessity for adopting a system which will not unduly tax the trees, and which will permit of an increasing yield of latex possessing a high percentage of caoutchouc during all future periods.

PERIODICITY OF CROPS.

Quite recently we gave statistics showing the gradual decline in crops from estates during the first quarter of the year. This we attributed to the wintering of the trees and to the prevalence of dry weather. The wintering of the trees, when associated with an abnormal dry season, has a very marked effect on the flow of latex, and we are hardly surprised to see that Mr. Malcolm Cumming expressed himself in favour of partially stopping tapping operations in the months of February and March. Mr. Cumming stated that had the Linggi estates belonged to him, he would, in February and March of this year, have given orders for all tapping to cease for a certain period; he proposed to advise the directors that in future years they should at least curtail their tapping operations and utilise the labour thus released for the cultivation of the estates during the wintering and the dry period. If this recommendation is seriously adopted it will lead to a pronounced periodicity as indicated by us in our recent issues. It will also very seriously affect the general organisation of estates. The effect of stopping tapping operations over half the planted area in the months of February and March will count for something in the market for the raw product, especially when that period of shortage coincides with a similar state in other parts of the world.—*India-Rubber Journal.*

A New Work.

A new work which will shortly come from the Press is Petch's "Physiology and Diseases of *Hevea brasiliensis*," which Messrs. Dulau and Co. are publishing at 7*s*. 6*d*. nett.

Mr. Petch, as Mycologist to the Government of Ceylon, has been engaged in the investigation of Hevea diseases for the last six years, and during that time has had submitted to him numerous examples of Hevea diseases from India, Burmah, Malaya, West Africa, the West Indies, and South America. He has, therefore, had exceptional opportunities of ascertaining what are the most serious diseases of Hevea, and how far the treatment recommended has been successful in each case. Several new diseases will be described for the first time, in addition to all those which have been previously recorded; while the influence of various catchcrops and intercrops on the prevalence of disease, and the effects of planting methods in promoting or discouraging it, will be discussed under the heading of general sanitation.

Rubber in New Guinea.

In 1907 a rubber and gutta-percha expedition was sent to German New Guinea by the German Colonial Business Committee to examine the resources of that colony in those products. This was a continuation of the previous activity of the committee, it having sent similar expeditions to Farther India, the Malay Peninsula, and to West Africa. Some of the

results of the South Sea expedition have just been published, and are of a very encouraging character. The gutta tree was found in paying numbers in the districts between the Malay Coast and the Bismarck Mountains. Dr. Schlechter, the expert of the expedition, says that the trees are more numerous than in the best gutta districts of Sumatra and Borneo. The yield varies between 4 and 12 lbs. of gutta per tree, while a maximum of 20 lbs. was found in the Minjem Valley. The expedition also discovered six new varieties of rubber-producing vines in the colony; but no information is as yet accessible as to quantities available, or value of product. The expedition established gutta and rubber stations in the Friedrich-Wilhelmshafem district, will be operated for three years, under the auspices and control of the Governor. One of the tasks of these stations is to instruct the natives in taking the sap of the trees. Gutta from German New Guinea has been reaching Hamburg for about four years, where the latest prices obtained were 8*s*. for first and 4*s*. for second quality.

Malayalam Rubber and Produce Co.

The directors of the Malayalam Rubber and Produce Company, Ltd. state, in their second annual report, that the tea crop for the period from 17th August totalled 1,469,833 lbs. The cost of putting the tea f.o.b. was 3·76*d*., and the nett selling price averaged 6·47*d*., leaving a profit of 2·71*d*. per lb. The rubber crop for the period was 13,212 lbs., the cost of f.o.b. was 1*s*. 4·41*d*. per lb. and the nett selling price averaged 5*s*. 1.56*d*. per lb., showing a profit of 3*s*. 9·15*d*. per lb. The cardamom crop for the period was 84,810 lbs. The cost of production was 5·26*d*. per lb. and the nett price realized was 1*s*, 3·83*d*. per lb. showing a profit of 10·57*d*. per lb. During the period 277 cwts. of coffee were harvested. The nett price realized was 45*s*. 1*d*. per cwt. and the cost of production 30*s*. 1*d*. per cwt., showing a profit of 15s. per cwt.

During the year the directors completed the purchase of several properties, which they paid for in cash and partly paid shares at a premium of 21*s*. per share. The premiums amounted to £26,958 15*s*., and this the directors have applied to the writing off of the preliminary expenses (£5,148 13*s*. 11*d*.), the under writing commission (£6,547 10*s*.), and in writing down buildings machinery and furniture, and writing down the cost of the estates. The nett profit for the period ended 31st December 1910, was £19,423 6*s*. 2*d*., out of which the directors propose to pay a dividend of 6 per cent. (less income tax) absorbing £15,317 10*s*. 8*d*. and to carry forward to 1911 the balance of £4,105 15*s*. 6*d*. The estimated crops for 1911 are as follows:—Tea 1,180,000 lbs. rubber, 31,000 lbs.; cardamoms, 60,000 lbs.; coffee, 500 bushels.

Travancore Rubber Co.

The fourth annual report of the directors of the Travancore Rubber Company. states that during 1910, 103 acres were cleared and planted with Pará rubber, and the capital expenditure for the period amounted to £4,134 3*s*. 5*d*., making a total expenditure after deducting the price paid in 1909 by the Orkaden River (Travancore) Rubber Company, Ltd., of £27,486 16*s*. 9*d*. The shares held in that Company are entered in the balance sheet at face value, although the market value is considerably higher. The crop of rubber for the year amounted to 6,385 lbs., and the average gross price received in London was 5*s*. 8½*d*. per lb. The greater part of the crop was secured in the latter part of the year. The profit and loss account shows a credit balance of £1,138 4*s*. 8*d*. which the Board propose to carry forward, subject the directors' and auditors' fees and incometax. It is estimated by the Visiting Agent and Superintendent that 30,000 lbs. should be secured during the current year. During the early part of the year tapping was suspended owing to the prevailing drought. The

suspension is common in Southern India, and is said to be of much benefit to the trees. The estates are reported to be in a very good condition and the growth of the trees continues to be satisfactory. Labour supply has been ample for requirements, and health on the estate has been good. According to a census taken in December last, there are on the estates 19,985 Pará trees planted in 1905, 152,672 planted in 1906, 21,198 planted in 1907, and 18,822 planted in 1910. The Ceará clearing was interplanted with Pará during 1910, and the Ceará has, since the commencement of the current year, been cut out.

Orkaden River (Travancore) Rubber Co.

The directors of this company, in their first annual report, state that the property acquired by the company has been duly transferred by the vendors. A new survey of the estate is soon to be made and some adjustment may possibly be required. During the year 264 acres were cleared and planted with Pará rubber. This clearing has turned out most successfully, and the whole estate is in a very good condition. The older rubber has shown most satisfactory growth. Labour supply has been ample for requirements, and health on the estate has been good. The total expenditure by the company during the period of the accounts, has been, £7,505 6*s*. 8*d*., as against the estimate in the prospectus of £7,555. 250 acres have been cleared since the commencement of the current year, and the Visiting Agent and the Superintendent report that the clearing promises well. A small amount of rubber (948 lbs.) was collected towards the end of 1910, and was sold well in London. It is estimated by the Visiting Agent and Superintendent that 5,000 lbs. should be secured during the current year. This crop will be dealt with in the factory of the Travancore Rubber Company, Ltd. The directors have to record with deep regret the deaths of their colleagues, Mr. Robert Porter and Mr. J. A. Weir. Both these gentlemen took a very active interest in the affairs of the company, and gave much valuable advice and assistance in the management.

Paloor (Travancore) Rubber Co.

The first annual report of the directors of the Paloor (Travancore) Rubber Company states that the property acquired by the company has been duly transferred by the vendors. During the period of the accounts, ravines, etc , to the extent of five acres have been planted with Pará rubber. Labour supply has been somewhat irregular, but is now sufficient for requirements. Health on the estate has been good. The total expenditure by the Company has been £7,883 17*s*. 7*d*. The 1907 rubber is reported as showing very satisfactory growth, while the 1908 rubber is not quite so good, but with rather more liberal cultivation the latter should be equally promising. The estate otherwise is in excellent condition. Tapping to a small extent will be commenced on the 1907 rubber towards the end of the current year, and it is anticipated that about 1,000 lbs. will be obtained. This crop will be dealt with in the factory of the Travancore Rubber Company, Ltd. According to census taken in December last there are on the estate 21,570 Pará trees planted in 1907, 34,412 planted in 1908, and 700 planted in 1910. The directors have arranged that the company's estate should be managed by Mr. R. Harley, Superintendent of the Travancore Rubber Company, Ltd., with the assistance of a resident Superintendent. Mr. J. A. Richardson has been appointed Visiting Agent. He has just arrived in this country for a few months, and he will be present at the general meeting. The directors have to record with deep regret the death of their colleague Mr. Robert Porter, who took a very active interest in the affairs of the company, and gave much valuable advice and assistance in the management.

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(INCORPORATED.)

Scientific Officer's Papers.

LXX.—ROOTS.

In ordinary plants water is continually evaporating from the leaves and, consequently, fresh water must be continually supplied from below or the plant will flag, wither, and die. No amount of rain falling on the leaves only will supply this demand for water because it is not absorbed by the leaves. Plants freshen up when there is a shower because the air is saturated with moisture and evaporation is checked.

Water is supplied to the leaves by the plants' roots which absorb the water in the soil and pass it up the stem to the leaves. The water in the soil is not pure, but consists of a dilute solution of salts of various kinds and these salts act as plant food which is thus absorbed by the roots. Consequently it is only soluble salts which can act as plant food, and when manures are applied they must be finally dissolved in the soil water before they can be made use of by the plant. The chief function of the roots is to supply water to the leaves and food to the plant. In the case of a big tree, like a Hevea Rubber for instance, an enormous quantity of water is evaporated daily by the leaves, and all of this is obtained by the roots from the soil. Exactly how much water is evaporated by a Rubber tree has never been measured, but experiments with a Birch showed that it had about 200,000 leaves and these transpired 60 to 80 gallons of water a day. A crop of Wheat weighing $2\frac{1}{2}$ tons per acre transpires 615 tons of water per acre during the whole time of its growth, which is equivalent to 6·09 inches of rain.

Transpiration in the Tropics must be even greater than this, hence it is of the utmost importance that the roots of a plant should spread out as much as possible in order that they may draw on a large volume of soil. Herein lies one of the advantages of cultivation; the soil is broken up so as to allow the roots to spread through it readily instead of being confined to a limited area.

Deep rooted plants, like Tea, are better able to resist drought than those which only make roots near the surface of the ground because they are able to draw water from the deep layers and the subsoil. In the dry weather at a place like Bangalore this is very marked; in the height of the dry weather the maidans are bare of vegetation, grasses and plants which only root in the top few inches of soil have dried out and are dead while Lantana and the trees, are breaking into new leaf; they are deep rooted and are drawing water from the lower depths of soil

Roots are of several kinds. The simplest form is a primary root, known as a *tap root*, going straight down into the soil. An easy way of studying root formation is to germinate a seed in a tumblerful of damp sawdust. Take for example a Coffee seed and place it close to the edge of the glass and watch it germinate. When it sprouts a small root will appear which immediately begins to grow downward. This downward growth is not mere accident; the growing tip of the root is influenced by gravity and always grows straight downwards. This can be proved by putting something under the bottom of the tumbler so as to tilt it at an angle to the vertical: it will be seen that the root at once changes its former direction of growth and again grows straight downwards. This property of growing roots is known scientifically as *geotropism*.

As the main, or tap, root grows, it begins to throw out side roots, which are developed in a definite number of rows. These lateral roots are not affected by gravity, but grow more or less at right angles to the pull of gravity. They in their turn develop side roots, and so on, and thus a spread of root, or a *root-system*, is gradually developed which in a big tree may cover an enormous area and draw water and food from a very large cubical mass of soil.

Moisture has a large influence on the direction of the growth of the lateral roots; they grow towards the wetter places. If one side only of the tumbler of sawdust is kept wet it will be noticed that the roots grow towards the wet side and leave the dry portions.

If the tips of the young roots are carefully examined they will be seen to be covered with a dense felt of fine hairs. It is by these delicate *root hairs* that the water is absorbed, and by these only. An old root with no root hairs on it cannot absorb water, it only acts as a kind of conducting pipe so to speak, and incidentally aids in anchoring the plant firmly in the soil so that it can resist the wind pressure on its branches. Roots bear root hairs on a restricted zone behind the growing point and these hairs have a comparatively short existence; as the root grows and elongates new root hairs arise, always at the same distance behind the growing tip, while the older ones die off.

It is evident, therefore, that when manure is applied to a plant it should be placed where these feeding root hairs can come into contact with it, and consequently it is useless to place it round the stem of the plant. It should be applied near the extremity of the root spread which may roughly be taken to be about the same as the spread of the branches.

It has been mentioned that the roots help to anchor the plant in the soil. This is a very important mechanical function on their part. In the case of a tree the resistance to the wind is very large and the strain on the roots proportionately great. Unless the tree were well anchored in the soil the wind would soon blow it down, or so shake the roots that they would be broken and the delicate root hairs torn off. It is well known that wind damages plants considerably; this damage is often due not so much to the fact that the leaves are stripped off and the branches broken, but that the roots are wrenched about and the feeding root hairs broken so that the food and water supply is checked. This is why plants often have a wilted appearance after being subjected to a wind storm.

The roots of a plant thus serve a three-fold purpose. First of all they procure the plant food, secondly they procure water, and thirdly they fix the plant in the medium in which it is growing. The food is almost entirely furnished by the fine rootlets which grow from every portion of the root,

but principally in the first few inches of the top-soil. The tap root proper has little to do with this collection of food materials; it fixes the plant and supplies water and is especially of value in the dry weather because it can draw on the water reserves of the deeper layers of soil and subsoil.

In some plants there is no tap root, but the roots branch out from the base in a cluster; these are known as *fibrous roots* and are well seen in the root system of grasses. Some roots act as store houses of reserve food material, usually in the form of sugar and starch. In this case the roots, or special parts of them swell out, and they are then said to be *tuberous*. Common examples of this kind of root system are the Turnip, Carrot, and Ceará Rubber. In the latter plant these tubers are the source of attraction to the porcupines and pigs which do so much damage by digging in the clearings.

In the case of a plant like Coffee the roots which are at first developed remain permanent throughout the life of the plant, but this is not the case with all plants. In some cases they develop secondary roots from the base of the stem called *adventitious roots*. This is well seen in some of the Palms, while creeping plants often develop adventitious roots at the joints of the stems, especially where these touch the ground. It is this habit which makes Hariali grass, and 'horse grass' so difficult to eradicate.

Finally a special class of plants have *parasitic roots*, like the Sandalwood and the Loranthus, or 'Mistletoes,' so common on the coffee shade trees. These roots bore their way into the living tissues of the host plant and absorb the sap, thereby weakening, and even in some cases, finally killing the roots or branches upon which they are growing.

RUDOLPH D. ANSTEAD,
Planting Expert.

Effects of Nitrogen, Potash and Phosphates on the Growth of Plants.

An investigation has been undertaken recently in connexion with this subject, the experiments being performed in culture solutions which contained nitrogen, potash, and phosphate in different proportions; the results of these are given in the *Botanical Gazette*, 1910, p. 1.

The plants grew best, as may be expected, when all three nutriment elements were present; the best development was in solutions containing between 10 and 30 per cent. of phosphates, between 30 and 60 per cent. of nitrate, and between 30 and 60 per cent. of potash. Where the best growth was made, the least difference took place in the proportions of the above food elements, while, at the same time, the whole strength of the solution suffered much more alteration than when the growth was poorer.

In a general way, the tendency seems to be for the plant to remove the material from the solutions in those proportions which would lead to its most favourable development. Other indications of interest were, that the greater the amount of any one constituent in the solution, the larger is the extent to which it is taken up by the plant, and that while the absorption of phosphate is low and that of potash high at first, the greatest response toward the end of development arises from the presence of nitrates. It is easily seen that the last of these matters indicates that very young plants require phosphates to a comparatively small extent, while their need for potash is correspondingly great.—*Journal of Jamaica Agricultural Society.*

Notes and Comments by the Scientific Officer.

118. *Earth-worms.*—Amongst the various agencies which are constantly at work in the soil producing physical and chemical disintegration of minerals, and the decomposition of organic matter, the Earth-worms find an important place. These animals swallow the finer particles of soil for a double purpose, making burrows and obtaining nourishment from the organic matter, and most of this material is carried up and deposited on the surface of the ground. Charles Darwin calculated that there were about 25,000 earth-worms in an acre of average English soil, and that by their combined action about ten tons of finely pulverised material was brought to the surface every year. This must play an important part in cultivation. Earthworms are most abundant in heavy soils, and here they do the most good because the small roots which reach deep into the sub-soil follow the worm-burrows. Mr. E. J. Russell has recently been studying this subject, and in a Report published in the Journal of the Agricultural Society comes to the conclusion that, "earth-worms do not appear to have any marked direct effect on the production of plant food. Organic matter seems to decompose with formation of nitrates equally quickly whether they are present or not. They are rich in Nitrogen, containing about 1·5 to 2 per cent., and they decompose rapidly and completely; thus they furnish a certain amount of plant food to the soil when they die. Their chief work is to act as cultivators, loosening and mulching the soil, facilitating aeration and drainage by their burrows."

119. *Painless destruction of animals.*—The U. P. A. S. I. are beginning to pride themselves on having an office which is a bureau of information of all sorts. A correspondent asks what is the best way to kill a pet animal painlessly. I cannot do better than refer him to a leaflet on the subject issued by the Royal Society for the Prevention of Cruelty to Animals some few years ago. For dealing with cats and dogs the following advice is given:—

"It is occasionally necessary, either through age or disease, to destroy favourite animals, and the most painless method is always desired. In such cases one of three processes is recommended: (1) Poisoning by prussic acid, (2) Inhalation of chloroform, (3) Drowning by experienced persons. When prussic acid is used, Scheele's strength should be employed. The dose for large dogs is 2 drams, and for small ones, or cats, 1 dram. The mouth should be opened, and the draught given direct from the bottle. When the animal is ferocious, it should be induced to seize a stick with its teeth, and the acid can then be easily injected with a syringe. Objection is often raised to the use of this acid, as it is supposed to cause pain; this I doubt, for the animal is dead in half a minute, provided the acid is of the proper quality. When chloroform is employed, the animal's head should be tied up in a bag or cloth, and the chloroform sprinkled on the part covering the nose. This method generally ensures a painless death.

"Drowning, when properly carried out, is attended by very little pain, death taking place very quickly. The animal should be placed in a basket or bag, and plunged into a tub or bucket filled with water, and kept under the surface of the water by means of a weighted second tub or bucket, which fits the first tub or bucket 2 inches at least below the surface of the water, and thus prevents the admission of air.

"Old dogs are easily destroyed by an overdose of hydrated chloral, which induces a heavy sleep from which the animal never awakes. It is impossible to conceive of an easier death than this. Dose for small dogs, 2 drams; for large dogs, ½ oz., dissolved in water."

RUDOLPH D. ANSTEAD, *Planting Expert.*

INDIAN TEA ASSOCIATION, CALCUTTA.

Extracts from Proceedings of a Meeting of the General Committee held at Calcutta on June 9, 1911.

Correspondence with the Indian Tea Association (London).—The Committee considered two letters dated, respectively, 11th and 18th May, from Sir James Buckingham, C.I.E., Secretary to the Indian Tea Association, (London). The principal matters dealt with in these letters were the following :—

(*a*) *Scientific Department.*—The terms and conditions of the agreements with the new officers to be engaged for the Scientific Department were considered in the letters. At the suggestion of the Calcutta Committee, it had been agreed in London that the period of the engagements should be five years; and that six months' leave on half-pay should be given at the expiration of the period. The idea was that this leave pay should be allowed irrespective of whether the officer was re-engaged, or not; except in the case of an officer declining to re-engage. In such a case no leave pay was to be granted.

In writing to London on the 8th June, the Calcutta Committee had expressed their approval of this proposed arrangement.

(*b*) *Shipments of tea from Chittagong by the Clan Line.*—It was mentioned in the proceedings of the meeting held on the 11th April 1911, that the General Committee had decided to approach the Indian Tea Association (London) regarding this question. The point at issue is as to whether the Clan Line, Ld., are at liberty, under their agreement with shippers of tea from Chittagong, to place on the berth any steamers other than their own liners. . . .

In his letter dated 18th May, Sir James Buckingham said that the question had been discussed at a meeting of the London Committee, which was held on the 16th idem. It was then decided to address the Clan Line, Ld., as suggested by Calcutta. The London Committee were unanimous in thinking that it is undesirable for the tea to be shipped from Chittagong by "tramp" steamers. They also agreed with the Calcutta Committee in thinking that the agreement contemplates no vessels other than Clan liners. In writing to the Steamship Co., they had made it clear that if, by reason of unforeseen circumstances, the engagement of a tramp steamer was unavoidable, the Company should be responsible for any additional insurance premium.

Scientific Department.—The General Committee noted, with satisfaction, from a letter dated 29th May from Mr. Claud Bald, President of the Darjeeling Planters' Association, that, subject to confirmation at a meeting to be held on the 24th June, the Committee of the Association had allotted a sum of Rs. 500 to the Scientific Department Fund. This contribution had been acknowledged with thanks on the 7th June.

The Committee considered a report by the Scientific Department Sub-Committee, with reference to the proposed central experimental station at Tocklai. This project was last mentioned in the proceedings of the meeting held on the 9th May 1911. The Sub-Committee had examined plans and estimates for the buildings which it is proposed to erect at Tocklai. The buildings are to be three in number, namely, two bungalows and a laboratory. . . .

RUBBER.

Ceara Rubber.

A considerable number of samples of Ceará rubber have been forwarded to the Imperial Institute from British Colonies and Protectorates, and the following selection of reports published in the *Bulletin of the Imperial Institute* gives the results of the examination of specimens from Ceylon, Uganda, the East Africa Protectorate, Nyasaland, the Sudan, and Southern Nigeria.

CEARA RUBBER FROM CEYLON.

The specimen weighed 10 oz. and consisted of three square sheets of light-brown opaque rubber, clean and well prepared, but a little mouldy on the surface. The physical properties of the rubber were very satisfactory.

A chemical examination gave the following results :—

	Per cent.
Moisture	0·9
Caoutchouc	91·3
Resin	3·1
Proteid	3·4
Ash	1·3

The specimen was valued at probably about 8s. per lb. in London, with fine hard Pará at 10*s*. per lb., and good to fine plantation Pará biscuits at 8*s*. 10½*d*. to 9*s*. per lb.

This rubber is of good quality and satisfactory in composition, except that the amount of ash is unusually high.

CEARA RUBBER FROM UGANDA.

1. Ceará rubber coagulated by means of lime-juice, and a very weak solution of formaldehyde added as a preservative.

The sample weighed 1½ lb., and consisted of thin biscuits of pale yellow rubber, very uniform in colour and excellently prepared. The physical characters of the rubber were very satisfactory.

The chemical examination gave the following results :—

	Rubber as Received.	Composition of dry rubber.
	Per cent.	Per cent.
Moisture	4·8	...
Caoutchouc	72·8	76·5
Resin	7·6	8·0
Proteid	11·9	12·5
Ash	2·9	3·0

The rubber was valued at from 8s. 2d. to 8s. 4d. per lb. in London, with fine hard Pará at 10s. 1d. per lb., and good to fine plantation Pará biscuits at 8s. 10¼d. to 9s. per lb.

This Ceará rubber is of very good quality, and its preparation leaves very little to be desired. The results of the analysis show, however, that the percentages of resin, proteid, and ash are all high, the amounts of the two latter constituents being much greater than is usual in biscuit Ceará rubber.

It is difficult to account for the large percentage of proteid (12·5) present in the rubber, unless it is to be attributed to the method of preparation employed, and it was suggested that it would be desirable to prepare for comparative analysis a few biscuits of the rubber by simply diluting the latex with water and allowing it to stand without any other addition.

2. Ceará rubber prepared with water only.

This specimen of rubber was prepared in response to the suggestion made in the preceding report. It weighed 1¼ lb. and consisted of three pieces of corrugated sheet rubber about ¼ inch thick, which were rather moist internally when received. The rubber was light yellow externally, but quite white within, and it was free from vegetable impurities; its physical properties were very satisfactory.

A chemical examination gave the following results:—

	Rubber as received.	Composition of dry rubber.
	Per cent.	Per cent.
Moisture	3·5	...
Caoutchouc	86·1	89·3
Resin	5·7	5·9
Proteid	3·6	3·7
Ash	1·1	1·1

The rubber was valued at 4*s.* 3*d.* per lb. in London, with fine hard Pará quoted at 5*s.* 2*d.* per lb.

This specimen of Ceará rubber is much superior in composition to the previous sample. The percentages of resin, proteid, and ash are all much lower, and the amount of caoutchouc consequently greater. It appears therefore that the method of coagulating the latex by simply adding water and allowing it to stand will give a much purer rubber than the process adopted in the previous case.

CEARA RUBBER FROM THE EAST AFRICA PROTECTORATE.

1. From the Kibos District.

The specimen weighed 2½ ozs., and consisted of a small ball of pale brown rubber which was very moist internally when freshly cut. The rubber was slightly sticky, but exhibited fair elasticity and tenacity.

An analysis gave the following results:—

	Rubber as received.	Composition of dry rubber.
	Per cent.	Per cent.
Moisture	12·4	—
Caoutchouc	58·9	67·2
Resin	10·5	12·0
Proteid	12·1	12·8
Insoluble matter ...	6·1	7·0
Ash	2·4	2·8

The sample was too small for trustworthy valuation, but rubber of similar quality would probably realise about 3*s.* per lb. in London, with fine hard Pará quoted at 4*s.* 3½*d.* per lb.

The percentages of resin, proteid, and insoluble matter present in this rubber are all rather excessive. These defects may, however, be due in part to the fact that the latex coagulated spontaneously in the incisions and the rubber had consequently to be collected as "scrap." Practically the whole of the resin and proteid present in the latex would therefore be included in the rubber.

2. From Kisumu.

This sample was stated to have been obtained from Ceará trees about 18 months old at the Mill Hill Park Mission Station near Kisumu. It

consisted of a small ball of light brown rubber, rather sticky externally and moist within. The rubber exhibited poor elasticity and tenacity.

An analysis showed the rubber to have the following composition :—

	Rubber as received.	Composition of dry rubber.
	Per cent.	Per cent.
Moisture	10·0	...
Caoutchouc	59·0	66·4
Resin	8·7	9·7
Proteid	13·9	15·5
Insoluble matter ...	7·6	8·4
Ash	4·02	4·46

The sample was too small for trustworthy valuation, but rubber of similar character would possibly realise about 3*s*. per lb. in London, with fine hard Pará at 5*s*. per lb.

The rubber is of inferior quality on account of the large amounts of resin, proteid, and insoluble matter present, which adversely affect its physical properties. It must, however be borne in mind that the rubber was derived from very young trees, and that the quality may improve as the trees become older.

CEARA RUBBER FROM NYASALAND.

This sample was stated to have been prepared from two-year-old trees by pricking. It consisted of a very small balls of light brown rubber, the average weight of a single ball being 1·08 gram. Some of the balls were moist internally, and a little vegetable impurity was present. The rubber exhibited fair elasticity and tenacity.

The results of the examination were as follows :—

Loss on washing (moisture and impurities)...	4·9
Composition of dry washed rubber :—	
Caoutchouc	78·6
Resin	10·8
Proteid	8·4
Ash	2·2

The rubber was submitted to brokers, who valued it at about 5*s*. per lb. in London, with fine hard Pará at 10*s*. 6*d*. per lb.

The rubber contained a high percentage of resin, but as it was derived from trees only two years old, this feature is not surprising. The amount of proteid is also excessive.

The value of this sample of Ceará rubber was placed at about half that of fine hard Pará, whereas Ceará biscuits from Nyasaland have realized prices equal to that of fine hard Pará (see this *Bulletin*, 1910, 8,128.) If, however, the rubber were less resinous than this specimen, there is no doubt that the balls would fetch a better price than the present quotation, and it was suggested that a number of mature trees should be tapped by the pricking process, and the rubber forwarded for examination and valuation.

The rubber obtained from the two-year-old trees would, however, be saleable, and if the pricking at this early age does not damage the trees, there is no reason why the method should not be adopted.

The relative values of the pricking and herring-bone system of tapping Ceará trees, as regards the yield and value of the rubber obtained and the effect upon the trees, will have to be determined by experiments in Nyasaland. The chief objection to the pricking method is that the rubber

is obtained in balls or as "scrap," but the use of a washing machine would obviate this drawback.

CEARA RUBBER FROM THE SUDAN.

The sample was labelled "Rubber from Ceará plantations in Mongalla," and consisted of five small biscuits of pale yellow rubber which were clean well prepared, and free from impurities. The rubber exhibited good elasticity and tenacity.

The rubber had the following composition :—

	Rubber as received.	Composition of dry rubber.
	Per cent.	Per cent.
Moisture	2·2	...
Caoutchouc	80·1	81·9
Resin	5·8	5·9
Proteid	9·8	10·0
Ash	2·1	2·2

The specimen was valued at 4*s*. 10*d*. per lb. in London, with fine hard Pará at 5*s*. 10*d*. per lb., and good to fine plantation Pará biscuits at 5*s*. 1*d*. to 5*s*. 4*d*. per lb.

This rubber, derived from two-year-old trees, is of very good quality, and its preparation is quite equal to that of any Ceará rubber on the market. In composition it is not quite so good as some specimens of plantation Ceará from Ceylon, but it is superior to samples from East Africa which have been examined at the Imperial Institute.

The results of this investigation are very promising, and indicate that the Ceará trees at Mongalla may be expected to furnish rubber of very good quality.

CEARA RUBBER FROM SOUTHERN NIGERIA.

1. From Lagos.

The specimen consisted of about 3 ozs. of rubber in irregular lumps, which had been formed by the aggregation of very small balls. The rubber was light brown and free from visible impurity. Its physical characters were not very satisfactory, as the greater part of the sample appeared to be slightly perished, especially on the outside of the lumps, and the rubber was very deficient in elasticity and tenacity.

The rubber was found to have the following composition :—

	Rubber as received.	Composition of dry rubber.
	Per cent.	Per cent.
Moisture	6·4	...
Caoutchouc	62·8	67·2
Resin	3·4	3·6
Proteid	22·4	23·9
Insoluble matter ...	5·0	5·3
Ash	2·6	2·7

The striking feature of the analytical results is the large amount of proteid contained in the rubber. The presence of this excessive quantity has probably arisen through the immediate coagulation of the latex as it issued from the tree, whereby the whole of the proteid matter in the latex was included in the rubber.

The rubber was submitted for valuation to brokers, who described it as rather stringy and perished scrap, and valued it at about 2*s*. 9*d*., with fine hard Pará quoted at 5*s*. 7*d*. per lb.

The investigation showed that this sample of Ceará rubber was unsatisfactory, both as regards physical properties and chemical composition, and that it would consequently fetch only a low price in the market.

2. From Olokemeji.

The sample was described as "Ceará rubber prepared by the Lewa method and afterwards smoked." It weighed 10 lbs. and consisted of cakes of rubber formed of aggregated balls, which were rather moist internally, and contained a little vegetable impurity. The rubber was dark brown externally but white within, and it had a strong smoky odour ; it was rather deficient in strength.

The results of the examination were as follows :—

	Per cent.
Loss on washing (moisture and impurities) ...	21·7
Composition of dry washed rubber :—	
Caoutchouc	84·1
Resin	7·8
Proteid	6·5
Ash	1·6

The value of consignments of rubber similar to this sample is uncertain, but they would probably realise from 4*s*. to 4*s*. 6*d*. per lb. in London, with fine hard Pará quoted at 6*s*. 11*d*. per lb.

This rubber is only of fair quality on account of its deficient strength. The large loss on washing is due primarily to the moist condition of the rubber. The percentages of resin, proteid, and ash are all rather high, especially the proteid.

If the latex flows sufficiently freely from the trees to be collected in bulk it would be advisable to prepare the rubber in the form of biscuits, by diluting the latex and allowing it to stand. This method would probably reduce the amount of proteid present in the rubber.

The appearance of this sample of rubber was greatly improved by conversion into crepe.

In Java and Sumatra.

A Consular Report states :—

1910 has been a most interesting year for rubber in Java, as the oldest of the Hevea plantations have now reached the productive stage. Little actual tapping has been done, but some half-dozen estates have made a commencement with this work, and the small quantities of "Java plantation" which have reached the London market have been conspicuous for the high prices realised.

Figures as to yields per tree are not yet available, but results obtained have been highly satisfactory, both as regards yield of latex and percentage of dry rubber. On many plantations trouble has been caused by root disease, but planters are taking energetic measures to check it, and the Government chemists are interesting themselves keenly in the matter and rendering the readiest assistance.

Of the capital sunk in rubber ventures during 1910, that of British investors easily takes the first place, and from figures compiled by the Netherlands Indian Agricultural Syndicate, it appears that in Java alone no less than £5,500,000 has already been paid up in respect of 87 British

companies with an authorised capital of nearly £7,000,000. The figures are admittedly incomplete, as the origin of all the capital is difficult to trace, and it is probable that the actual British interest is even greater.

The agricultural syndicate mentioned above has also endeavoured to collect statistics as to the area planted with rubber in Java and arrived at a total of 157 estates, with an area of 85,000 acres of planted rubber, principally Hevea Braziliensis. These figures are, however, recognised as incomplete, and owing to the apparent reluctance of many planters to furnish returns, it will probably be some years before reliable statistics can be obtained.

An interesting feature in connection with the rubber industry has been the establishment in Java during 1910 of a British firm of rubber engineers, who are constructing large numbers of temporary and permanent rubber factories.

An inferior variety of wild rubber, the export of which has of late years attained considerable proportions, is that known as jelutong. This product is collected by natives in the forests of Sumatra and Borneo and is obtained from trees belonging to the *Dycra* and *Alstonia* families. As the method of collection employed by the natives is extremely destructive to the trees, the Government of Netherlands India has found it necessary, in order to prevent their extermination, to impose restrictions on the collection of jelutong. Concessions for the exclusive right of collection have already been granted to two companies, one American and the other German, and there are still large stretches of territory available.

Stumping on Estates.

Some time ago I was asked to settle a dispute as to when the removal of stumps from an estate should take place, one of the disputants holding that it should be done in two and a half years, after planting. One would have thought, perhaps, that there could be no question at all in any planters' mind on the subject, but as there is obviously some doubt as to the matter in the minds of some, it is perhaps worth while pointing out, that the object of removing the stumps is to clear out and prevent the development of the termites and Fomes.

Now both these pests attack living or dying trees, not dead and rotten ones. I have never yet seen *Fomes semitostus* on trunks that were actually rotten. The danger lies in the half dead trees on the estate after the burn. In two and a half years, many will be rotten altogether and harmless, though even then there will be some which still retain enough vitality to start a Fomes attack under ground, but it is in the first six months, or year, that the real damage is done though the Fomes may not show itself in the rubber tree till later when the roots of the tree are big enough for the mycelium to attack them.

It is obvious then that the stumping should be done before planting if possible, and not deferred till later. Again stumping is not so easy after the trees are two years old; there is a great risk of burning or otherwise injuring the young trees, while getting the stumps destroyed.—*Journal of Jamaica Agricultural Society.*

Rubber in Burma.

Lord Lamington, late Governor of Bombay, contributes an interesting article to the current number of the *Financial Review of Reviews*, on investments in India.

In dealing with the undeveloped resources of the country Lord Lamington points out that it has already been demonstrated that several varieties of rubber can be profitably cultivated, but although it is over thirty years since Pará rubber was first introduced into Burma, the rate of development of its cultivation, partly through ignorance on the part of the general public as to the progress of the experiment—has been lamentably slow. "It becomes a duty to protest against the altogether extravagant delays of which the Government of Burma has been guilty in disposing of applications for rubber grants." According to Lord Lamington, eight months is the normal period requested to enable the authorities to come to a decision on a simple application for a grant of land for the purpose, and even this interval is often exceeded.

Rubber Projects in Brazil.

The Northern rubber markets, writes the *Economist's* Rio correspondent under date May 16th, are very much depressed; and, as far as the producer is concerned, the present position is decidedly unsatisfactory. Prices have dropped still further during the past fortnight, the decline being aggravated by the increasing stocks in both Pará and Manaos, these now exceeding some 6,000 tons, valued at about three millions sterling. The Banco do Brazil has advanced very large sums against these stocks, and, according to the general opinion, it is not in a position to grant further help. Holders are in hopes that consuming markets will soon feel the effect of the large quantity of rubber thus withheld and at present locked up in Amazon markets, and will consequently offer better prices. The slack season is now rapidly approaching, and this also induces holders to expect an improvement in the near future. In the meantime, as the situation has become almost desperate, various schemes for getting prices up have been elaborated and given free circulation. Any initiative in this direction has, of course, met with very warm support from producers but so far nothing definite has been decided upon. Deputy Passos Miranda has proposed to the Federal Government the adoption and execution of the following measures, which, in his opinion, would effectively solve the serious difficulties affecting the rubber trade:—(1) Improvement of navigation on the rivers Negro, Branco, Purus, and Acre; (2) construction of cart roads from Cameta to the Alto Xingu, Itaituba to the Sao Miguel River, Obidos to the Guyana frontier, Manaos to Conceicao do Urubu (frontier), and finally from Almerim to the sources of the Pará River; (3) erection at Pará and Manaos of suitable building for the reception and accommodation of immigrants, and of ten hospitals in the interior. Colonisation of the national Rio Branco farms and general lands between Obidos and Pará, and the establishment of six model farms for cattle-breeding and agriculture as follows:—In the State of Pará (at Marajo and Braganca), in the State of Amazonas (at Rio Branco and Manacapuru), and in the Acre Territory (at Xupury and Catay). To carry out these works Dr. Passos Miranda suggests that a loan of £6,000,000 should be raised at about 97 per cent., with 5 per cent. interest and ½ per cent. for amortisation per annum, the service to be covered with the product of a tax on rubber, both State and Federal, of 200 reis per kilo. Such a tax, he estimates, would yield at least £466,000 per annum. The project, from an economical point of view, seems infinitely superior to the Sao Paulo coffee valorisation scheme, inasmuch as it does not depend on artificial means of improving the value of the commodity. The measures proposed are all in the direction of reducing cost of production, either by improving communications or encouraging immigration. Easier navigation and practicable roads would not only contribute to increase, or at least maintain, the present production at a lower cost, but would also materially help in the opening up of these vast, fertile regions by the cultivation of other commodities besides rubber.

SELECTED CUTTINGS.

Economic Entomology and Health Administration.

Economic Entomology, as a separate branch of applied zoology, may be termed a young science. For centuries, the large brightly coloured or peculiarly shaped insects, such as certain butterflies, moths, and beetles, have attracted the attention of even casual observers, and have been collected and studied by entomologists. Few persons, however, seriously applied themselves to the task of determining the effect of insects, as a class, on the affairs of men until within comparatively recent times, and in the first instance, such application was almost entirely in reference to the relations between insects and plants. The discovery of the connexion which exists between certain insects and the dissemination of disease of animals, including man, has within even more recent years, resulted in the development of an entirely new branch of study and investigation.

It is not difficult for mankind to realize the relationship existing between a plant and an insect, when for example, the leaves of a plant are devoured by caterpillars. It is not as easy, however, to understand the connexion between the bite of a mosquito and a subsequent attack of malarial fever, but, as a result of careful and patient study, the relationship in the latter instance is as well proved as in the former.

It has long been known that the abundance of the insects that prey upon agricultural crops has a very direct bearing on the development of newly settled countries, but it has only recently been understood how great an influence insects of other kinds have on the ability of men to keep their health, while opening up such countries, and on the health of their domestic animals, on which in such circumstance so much depends.

The order Diptera, which includes those two-winged insects known as flies, is perhaps the most important group of insects, as far as the dissemination of disease is concerned. Yellow fever, malaria, and filaria, are communicated to man by the biting of mosquitoes, which are of this order, while sleeping sickness of man, and the related diseases of animals in which the causative agency is a trypanosome, are communicated by the bites of other blood-sucking flies. Typhoid fever is transmitted by the common house fly, which merely acts as a carrier in a mechanical way; but the insects previously mentioned are intermediate hosts, and are necessary to the development of the parasitic organism causing the disease.

Ticks, which are related to the insects, infect cattle with Texas fever, or red-water, and are known to transmit other diseases, acting as intermediate hosts of the disease-producing organism in the same manner as the insects mentioned above.

It seems likely, also, that other relationships between insects and diseases may be demonstrated in the future. A very brief consideration of the effects of the diseases mentioned will serve to illustrate the very important bearing of insects on great developmental problems.

A list of the colonies of the British Empire in which there are employed at the present time scientific officers trained in entomology with the dates at which these officers were first appointed, would show remarkable progress within the last fifteen years, and in other countries the progress has also been great, especially in the United States.

Government entomologists are for the most part connected with agricultural departments, but the increasing knowledge of the manner of the spread of disease is resulting in more particularized entomological training on the part of medical officers, and the schools of tropical medicine are

offering increased facilities for the study of entomology relating to the practice of medicine; in fact, at all institutions of learning in science, entomology is receiving an increased amount of attention.

The African Entomological Research Committee, appointed in 1909 by the Colonial Office, of which a brief account was published in a recent number of the *Agricultural News* (see Vol. X, p. 90), affords evidence of the recognition by the Imperial Government of the value of the study of entomology in connexion with diseases and agriculture.

The principal object of this committee is the investigation of tropical diseases and of the insect agencies by means of which they are disseminated. Insects of importance on account of their relations to crops are also collected and studied. Under the direction of the committee, entomologists are sent out to tropical Africa, who make collections of, and notes on, blood-sucking and other insects, and also endeavour to enlist the co-operation of medical and other officers, whom they instruct, when necessary, in the best methods of collecting, packing, and forwarding insects for study.

Agriculture, as an industry, is fundamental, and agricultural products are the world's greatest necessities. The ability to produce the greatest amounts of these products with the least loss from preventable causes should be included among the aims of governmental activities. To preserve the health of its subjects should be also a matter of concern to a government; for whatever may be the agricultural possibilities of any locality, these are not likely to be fully realized while deadly diseases play havoc with the health of the inhabitants, and of domestic animals. These facts are becoming more and more realized, and the important bearing of entomological knowledge on the productivity of agricultural and other districts, especially in the tropics, is increasingly apparent. The results that have been achieved already in combating the insect pests of agricultural crops, and the control of such diseases as yellow fever, malaria, and Texas fever, are sufficiently striking and important to direct attention to the enormous possibilities along these lines.

These matters are of first importance to governments, since the prosperity of a nation depends on the well-being and health of the people, and it is only when those who are responsible for governmental administration control, through their officers, the necessary investigations and experiments, and the practical application of the acquired knowledge, that the greatest good can be expected to accrue.—*Agricultural News.*

Mycology in Relation to Administration.

The systematic study of the diseases of plants and its application to general agriculture has developed almost entirely within the last sixty years. Although the existence of various fungi has been recognised for many centuries, yet little if anything was known of their real nature until the middle of last century; their life-histories were almost entirely unstudied, and many of them were believed to be abnormal developments of the leaves and other parts of flowering plants. Under such circumstances, it was only natural that nothing should be known of their connexion with plant diseases, and that the latter were generally attributed to bad soil conditions, the occurrence of excessive rains, or drought, and similar factors. In some instances, where large insects, such as the larvae of beetles, or of moths and butterflies, were found in considerable numbers in connexion with disease, it was realised that these were the cause; while in others, when the disease was of a violently epidemic nature, it was usually said that the plants were destroyed by a blight. Instances of this are the blights reported at various times on cacao in Trinidad, and that said to have

destroyed the cocoa-nut palm in Antigua. The use of the term 'blight,' referring as it does only to the general appearance of the effected plants, shows clearly the complete lack of information that existed among planters and farmers as to the real cause of the appearence. This lack of information continued even up to very recent times; while the confusion between insects and fungi, which occurred among eminent scientific men as late as the forties of the last century, may be found among planters at the present day. There is, however, much excuse for this, as no means were in existence, until comparatively very recent years, for rendering available to the practical man, to whom it was so much importance, the information that was being rapidly accumulated by scientific investigators.

The real recognition of the important part played by fungi in connexion with plant disease dates from the publication in 1866 of De Bary's book on the comparative morphology and physiology of the fungi, in which details of life-history and parasitism in the case of many forms are clearly set forth. This gave a great stimulus to many investigators, so that during the subsequent thirty years an immense mass of information was accumulated both in connexion with the life-histories and pathological importance of many species, and with their systematic classification and the nature of their reproductive arrangements. It should, however, be borne in mind that practically the whole of the work was carried out by private individuals, either working in their own laboratories or in those of various universities and academic institutions throughout the world. As a consequence of this, the information obtained was only available through the medium of the more advanced teaching establishments, or of the universities, to those engaged in the study of Natural Science, and its importance from a much wider agricultural point of view was not fully recognised. Along with this development in the knowledge of their parasites went a very rapid increase in the understanding of the nature of plants themselves, so that by about the year 1880 there were accumulated large stores of knowledge available for the right direction of a campaign against plant diseases.

Once the information had been obtained, the next step from the agricultural standpoint was to render it useful to the planting community. This was done by the recognition by Governments of the importance of the work that could be performed. In England such recognition consisted for a long time in the employment of a research mycologist on the Staff of the Royal Botanic Gardens, Kew. One of the first countries in which prominence was given by the Government to the practical application of mycological knowledge would appear to have been the United States. For the last thirty years this country has been employing an ever increasing number of plant pathologists in connexion with the Department of Agriculture of the Federal Government: while at the present time almost every State Experiment Station, supported largely from the funds of that State, has one or more mycologists on its staff.

When the Imperial Department of Agriculture was founded in 1898, it soon became evident that officers capable of dealing with the pests and diseases of plants were urgently needed, and this was well emphasized by the prevalent diseases of the sugar-cane. About the same time it became necessary to appoint a mycologist on the Staff of the Royal Botanic Gardens at Peradeniya in Ceylon, and at the present time almost every Government Department of Agriculture in the British Empire employs one or more such officers. In India, not only is there an Imperial Mycologist to the Government of India, aided by an assistant mycologist and several research students, but one at least of the Presidencies, Madras, has its own

officer. Instances of the employment of Government Mycologists could be added from all parts of the world.

These Departments of Agriculture bring about the dissemination of what is known in connexion with fungi in two ways. They work directly through the association with planters of the scientific officers on their staffs, and indirectly by means of their publications; while at the same time, owing to their connexion with the Government, they are able to introduce the teaching of the requisite scientific knowledge into the curricula of the schools. This last point serves to emphasize the importance that attaches to the connection of scientific knowledge with so thorough an instrument for inducing its spread as is provided in the form of the various Governments.

Further valuable assistance in the protection of plants from disease is rendered by Governments through the legislation which they are empowered to enact. Such legislation can prevent the importation, into any given country, of diseases likely to cause serious damage to its crops. At the same time it can enforce, if necessary, the adoption, of adequate measures for eliminating, or eradicating, the more serious diseases which do exist. In both these cases the technical knowledge of the scientist is necessary, though this alone is powerless without the aid of the Government machinery for enforcing the necessary measures, and without the general appreciation of the reasonableness and wisdom of the measures on the part of the community.

The recognition of the inportance of mycology on the part of Governments has been followed by similar recognition on that of the general public. As a consequence of this, there exist to-day several associations of planters, and more than one private company engaged in agriculture, who maintain a scientific staff, including a plant pathologist, at their own expense. The Hawaiian Sugar Planters' Association may be cited as an instance of this. Moreover, the tendency on the part of private companies to employ their own mycologists is distinctly increasing. This tendency, although a step in the right direction, is not to be advocated without qualification. There is considerable probability that the money necessary would be much better spent in contributing to the maintenance of a larger number of such officers on the staffs of the various Government Departments. There are several reasons for this. In the first place, it is far easier to work in a large and properly equipped central laboratory than in small isolated ones. At the same time, the work receives material assistance from the concentration of effort, the free access to literature from all parts of the world, containing information on mycological subjects, and the sympathetic intercourse between men engaged in similar study, all of which are only obtainable at a central laboratory.

The increasing demand for plant pathologists makes it important that some sufficient means should be found for supplying properly trained men, and in this it would be of great assistance if the Universities would provide adequate courses of instruction, not only in the methods of mycology and in those of its application, but also in general tropical agriculture.

The demand for such men will in course of time become limited, but it will always be constant. Such a training might with advantage be followed by a year's research work at the laboratory of one of the tropical Departments of Agriculture. Facilities for this exist at Pusa in India, and also in Ceylon, and Java, for the East, and in the Imperial Department of Agriculture for the West.—*Agricultural News.*

The Planters' Chronicle.

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Mr. and Mrs. R. D. Anstead desire to express their heartfelt thanks to the many friends from whom they have received letters of condolence on the death of their only son, and to assure them that their kind sympathy in the time of trouble has been deeply appreciated.

Mr. Anstead hopes to be able to reply to all these letters personally, but stress of work and other matters have prevented his doing so hitherto.

Hybridisation of Coffee.

The Collector of the Nilgiris has been informed that the U. P. A. S. I. is prepared to accept the arrangement proposed by the Government of Madras for the opening of an experimental plantation on the Nilgiris for the hybridisation of coffee.

It is hoped that arrangements for the opening of the plantation will now be pushed on with.

Proposed Coffee Cess.

The Secretary to the Government of Madras, Revenue Department, writes, under date 4th instant, as follows:—

"In continuation of Mr. Wynch's letter No. 2880 dated the 20th October 1909 and with reference to the correspondence ending with your letter dated the 15th February last, I am directed to inform you that the Government of India have again given their careful consideration to the matter and regret that they do not see sufficient grounds for altering their previous decision communicated to you in my letter No. 1685, dated the 24th June 1909."

This subject will be brought up for further consideration at the Annual Meeting next month.

Indian Tea Cess Committee.

At the same meeting it will be necessary to elect a nominee for appointment as a member of the Indian Tea Cess Committee, to fill the vacancy caused by the resignation of Mr. George Romilly.

Mr. Henry Wickham.

Cable advices state that the Rubber Growers' Association, at a Banquet in London on July 7th presented Mr. Henry Wickham with an address, a cheque for 1,000 guineas, and an annuity, in recognition of his introduction of Pará rubber into Ceylon.

India's Import Tariff.

It is notified that nitrate of lime, calcium cyanamide, and mineral superphosphates are exempted from the import duty leviable under the Indian Tariff Act.

Scientific Officer's Papers.

LXXI.—Farmers' Institutes in the United States of America.

Meetings which the general public, and especially farmers, were invited to attend were held under the auspices of the local, or State, agricultural societies at an early stage of the development of the Agricultural Department in the United States of America, a Department which has now grown to huge dimensions, and to which the United States Government this year allotted the sum of 16,900,016 dollars. The American Agricultural Department is in fact probably the finest and the best organised in the world. Out of these meetings gradually grew a more or less well defined institution for the technical education of farmers which is now known as the Farmers' Institute. While the institutes are carried on under various auspices in the different States the character of the meetings themselves has been essentially the same wherever they have been held. They are usually held during the winter months, but in some cases at other seasons of the year, and they generally last over a period of two to four days. At them an address, or lecture, by some specialist is delivered and full and free discussion of the subjects introduced is aimed at. All those who attend, the humblest as well as the most prominent, are urged to ask questions and to present facts gained from personal experience. From small beginnings the Farmers' Institutes have been developed into a very important factor in the agricultural life of the United States. They are now held under State organisation and the Government Department of Agriculture keeps in close touch with them, and aids the lecturers employed by the Institutes to obtain up-to-date information regarding the progress made in agricultural science and practice. Among other devices for interesting farmers in scientific agriculture, and improved methods, special trains are run on the railways in agricultural districts which carry exhibits and lecturers to thousands of farmers in many parts of the country, and this has proved a very popular scheme. In fact, the Farmers' Institutes appear to stand between the Government Agricultural Department and the farmer, and act as useful distributing agencies of the knowledge obtained from the experiments at the agricultural laboratories and Experiment Stations to the men on the farms. In 1905 the Secretary of the Agricultural Department in his Annual Report said of the Farmers' Institutes :—

"Recent years have also witnessed the development of a great system of popular agricultural education for the adult farmer through the farmers' institutes which are now held throughout the country, and annually attended by about a million men and women engaged in agricultural pursuits. With the growth of the research work of this Department and the experiment stations it has become very evident that publications alone would not meet the demand for information regarding improved methods of agriculture, and the ways in which the results of scientific investigation may be applied to agricultural practice. The absence of agricultural instruction in the schools and the coming on to the farms of millions of people from foreign lands, together with the wide-spread interest in the results of agricultural research, have made it necessary that means be devised for giving agricultural people instruction by word of mouth which will enable them to understand and utilize the information so largely given out in the publications of this Department and the stations.

"For this purpose the farmers' institutes established under public authority in the States and Territories furnish an agency of great usefulness."

There has recently come to hand the proceedings of the Fifteenth Annual Meeting of the American Association of Farmers' Institute Workers, which contains a great deal of interesting matter.

The leading objects of Institutes are there stated to be :—

"To give information, by calling attention to nature's laws with which the farmer must deal; by emphasizing the importance of working in harmony with these laws, thus whetting the desire for more systematic knowledge than the institutes can afford; and by pointing out the sources of such knowledge.

"To give inspiration; by citing examples of good methods and worthy achievements; by setting forth true ideals and the proper goals of effort; and by pointing out the possibilities of agriculture and of life in the open country.

"To begin the training of men and women for local leadership and wider usefulness. . . . .

"To inaugurate movements for better systems of cropping, better seeds, better live stock, better roads, better homes, better social conditions, better schools and churches. . . . .

"To interest and enlist the boys and girls of the farm in lines of work which will result in their own development, and in the training of a more intelligent and more successful class of farmers.

"To pave the way for intelligent, effective, co-operation by bringing together representatives of various farmers' organizations for the joint consideration of measures of mutual interest."

From the Report of the Committee on Institute organization and methods it appears that, "Many States are now employing from 12 to 25 lecturers for institute work only, the season of employment varying from 1 to 6 months. In such States these regular lecturers are assisted by specialists from the colleges of agriculture and the experiment stations. For example, Nebraska employs 12 men as institute lecturers only, and draws an equal number of helpers from the college and station staff, as needed. There were 242 farmers' institutes, and 32 institutes for women, held in that State during the year. Michigan employs 25 lecturers for institute work only, and secures 25 others from various sources, holding 346 farmers' institutes, and 54 institutes for women."

Planters' Associations might well develop along somewhat similar lines, and perhaps in the Millennium they will do so. In the meanwhile the following extracts taken from a few of the addresses made at the Annual Meeting of this Association of Workers may prove of interest, dealing as they do with problems which are not unknown in Southern India. The President, who hails from Canada, during the course of his address said :—

"The stability of the Nation depends upon the quality of the agricultural instruction of the future. Agricultural advancement is the barometer of national progress; and it is high time that National and State legislatures, all municipal organisations, and local societies of farmers, should unite forces and give to agriculture that encouragement, assistance, and direction which it merits. As a national business investment, the wise expenditure of millions more in agricultural investigation, instruction, and demonstration, on this North American Continent would not only be returned to the Nation manyfold in increased production, but would strengthen the position of the Anglo-Saxon race as a world-power."

Again when speaking of co-operation, which is sadly lacking and much needed among planters, and planters' associations, in this country, he remarked :—

"In order that the farmer may take full advantage of his investment of capital, labour, and thought, it is essential that he co-operate with his fellow farmers in such ways as will insure a just proportion of the retail values for

the producer. The margin which now exists between the retail price and the returns to the producer is altogether out of proportion. Co-operation has been one of the strongest factors in agricultural advancement in some of the most prosperous countries."

"The railway manager appreciates the value of the services rendered by the surveyor, engineer, bridge builder, accountant, detective, and other specialists; so the farmer who makes a close study of his industry values the services which can be rendered by the chemist, entomologist, botanist, dairyman, and live-stock specialist. While the entomologist or chemist, as such, cannot be relied upon to successfully manage a farm, the farmer appreciates him as a person able to give timely information and direction in his own particular branch. There is a work for all these men in co-operation with the farmer; and while the farmer cannot hope to fully master the details of these sciences in their relation to agriculture, he cannot farm successfully without calling those specially trained to his assistance."

The deputy minister of agriculture for Ontario delivered an address on 'the problem of the indifferent farmer' which is full of home truths, as the following extracts will show:—

"We all know the indifferent farmer; he is here on this North American Continent by the tens of thousands. We who are workers in the agricultural field come in contact with him continually. He is the burden of our existence; he is largely the excuse for our office. He has been here since work first began and one can hardly hope that he will ever become entirely extinct. If we had no direct experience with him we would have strong suspicious of his existence simply by reading the daily paper, for are his shortcomings not set forth there from day to day? Frequently the news editor confuses indifference and dishonesty, for you know there is that curious streak in us which makes a basket of scaly peaches loom as large as a carload of faulty rails, and a dozen small apples in the middle of the barrel rank with the flaw in a 40-foot bridge.

"How big is this problem? In the Province of Ontario we have 175,000 farms whose productions total about $250,000,000. If by some magic, or process of regeneration, we could turn all the indifferent farmers into wide-awake, progressive, up-to-date farmers, the total production would be easily doubled, and it is not beyoud the reach of possibility to treble our output. We have in Canada, as you have in the United States, a Commissioner for the conservation of resources. As far as the Province of Ontario is concerned we are concerned not so much with the preservation, or conservation, of our agricultural resources as with the need for expanding and enlarging the agricultural resources that nature has given us. To do this we must not merely help the wide-awake farmer, but we must wake up the indifferent farmer.

"Is it worth our while to take hold of this expansion in real earnest; that is as though we believed it could be done? The possiblity of adding two or three hundred million dollars yearly to our rural income surely makes this a big problem. Let me ask right here: Is there any other problem on the American continent that comes into the same class with it? You gentlemen who are engaged in this field know how it is worked out. You know the foundation courses upon which this great wealth may be built. These courses are plain and simple: (1) Drain and cultivate the soil, (2) sow only the best seed, produce only the best crops, (3) carefully protect and store the products of the fields and the orchards, (4) feed farm products only to profitable stock, and (5) put the finished product on the market in the best form.

"If we could in some way bring the indifferent farmer to the knowledge of those five plain, convincing, lines of work, we would have solved the problem; all else would come easily as a natural sequence. . . . . .

"All this line of development looks to be so simple, and therein is one of the greatest difficulties; it is its simplicity that makes it so difficult. If we could present a problem more intricate, and more daring, we could expect to set the people to its solution. Look over the great problems that have attracted the people of influence, the people of initiative power, and the people who control the creative forces and the distribution of wealth. This simple problem of stirring up the indifferent farmer to activity does not as yet appeal to the people as it deserves. Here are two areas of land 10,000,000 acres each in extent. The one is occupied by farmers, good, bad, and indifferent. The other area is unoccupied, it is as nature made it, but it is 500 miles away. Two questions arise—shall we develop the agriculture of the occupied area, double its production, double its population, and again double its production, or shall we set to work to build a railroad to that unoccupied land, there to repeat the experience of the former section; farmers good, bad, and indifferent? You know what would be done. Millions will be available for the more daring proposition and thousands only for the other.

"It is easier to build a *Dreadnought* than an agricultural college. We can arouse the interest of two continents in solving the problem of aerial navigation, but it is difficult to get the people to demand—no, let me put it more mildly—it is difficult to get the people to support the proposition of spending money freely in teaching the indifferent farmer how to drain his land, what special fertilizers he should apply, why he should use only the best seeds, why he should test his dairy cows, why and how he should spray his apple trees, and how, in short, he can increase his income by 1,000 dollars a year." . . . . .

"Wake up the indifferent farmer and you develop one of the great assets of the country. It is not like taking gold or silver out of the ground never to be replaced; it is not like cutting down trees with the hope that others will grow up in the next 50 years; it is not like pulling fish out of the water that some one may be fed. No; it is better than all these, for you are bringing into productivity a living asset. I know no work that any country on this continent can engage in that promises bigger returns for everyone than the rational stimulating and helping of the indifferent farmer to better ways and better living. The banker wishes the farmer to produce more, because it is upon the accumulation of his earnings that our banks largely depend. The railways want more stuff to haul to and fro; the manufacturer wishes the demand for goods to be increased; the storekeeper is looking for the increase of purchasing power in the farmer, and the country school-teacher is hoping for better pay; all classes want more money in circulation. Then, why, as a people, do we not get down to the consideration of this question in a manner comporting with its importance? Let us devise things, not from the narrow standpoint of the needy farmer, but having in view the national importance of the question. Let us put into it some of the energy and the brains and the money that we have put into transportation questions, manufacturing, mining, and city expansion. If we could get our legislators and our city millionaires to turn their eyes towards the rural parts and take hold of the question in earnest there would be a national development in this country that was never dreamed of by the most ardent enthusiast. Let us keep in mind and compel others to pay attention to the regeneration of the indifferent farmer, for he is the greatest undeveloped asset of either Canada or the United States."

RUDOLPH D. ANSTEAD, *Planting Expert.*

Notes and Comments by the Scientific Officer.

120. *Valuation of Hybrid Coffee.*—During this year several samples of Coffee picked from Hybrid trees have been cured separately and sent home to be valued. The results, on the whole, may be considered satisfactory, especially when the increased yield obtained from such trees as compared with the ordinary Arabica tree is taken into consideration, and go to prove that the hybrid will be more profitable than the ordinary coffee. I am not at liberty to publish the names of the writers of the letters quoted below, but I can assure planters that they are from men of the highest standing. The report on the first sample runs as follows:—"Referring to the sample of Hybrid coffee you sent us in February, which we forwarded to our London Office for report and valuation, they now advise that their Brokers report as follows:—Good well dried parchment, very bold, colory greenish, rather well made, about 90 shillings. The coffee is very fine as far as we can judge by peeling a few of the beans, and as it is, should fetch a good price. We cannot, however, guarantee that a large parcel cleaned through the usual machinery will turn out equally good. The size of the bean is very bold."

From another estate two separate samples were submitted and they were reported on as follows:—"No. 2. Heavy, brownish, unsized Coffee, rather foxey, apparently a hybrid, probably grown from Liberian seed. Valued at 62 shillings per cwt. No. 1. Rather better colour than No. 2. Valued at 63 shillings per cwt."

At Havre these samples were valued at about 75 fcs. cif DW. the No. 2 being liked better than the No. 1, but it was remarked that, "the price will very much depend upon the taste."

121. *Suitable Localities for Hevea Rubber.*—Since the Rubber 'boom' I am constantly receiving enquiries as to whether I think such and such a locality is suited to growing Hevea. In considering this question, apart from soil, two things must be taken into consideration, first elevation, and secondly rainfall, and its monthly distribution. With regard to elevation, anything over 1,000 feet is out of the most favourable zone. Hevea will grow, and is growing well, up to 3,000 feet in Southern India, but above 1,000 feet it is slow in growth, and at high elevations is apt to be very slow indeed. Of course there are specially favourable places where it grows rapidly and well at high elevations, but as a general rule below 1,000 feet is the best. The rainfall should be about 120 inches and not less, and it should be well distributed throughout the year for the best results. A point which is too often overlooked is the length of the tapping season when the rubber has grown. Take a rainfall like the following for instance, combined with a high elevation, which has recently been submitted:—

January and February, nil; March, 1; April, 4·50; May, 4; June, 18; July, 25; August, 19; September, 9·50; October, 10; November, 3; December, 1. Little or no tapping could be done in June, July, and August as the heavy rain will wash the latex out of the cups. By the end of November the trees will begin to winter and there is not rain enough to start tapping again until the beginning of April. This leaves a bare six months' time in which tapping can be done and this, combined with a long wait before the trees reach a tappable girth, by which time the price of Rubber will have, in all probability, dropped considerably, makes such a locality unsuited to Hevea cultivation.

RUDOLPH D. ANSTEAD,
Planting Expert.

DISTRICT PLANTERS' ASSOCIATIONS.

Wynaad Planters' Association.

Proceedings of a Meeting held at Meppadi Club, July 12th, 1911.

PRESENT.—Messrs. Atzenwiler, Bownass, Gillatt, J. C. Parker, G. C. Parker, Powell, Stewart, Vernede and C. E. Abbott, Honorary Secretary.

Mr. Atzenwiler in the Chair.

1689. *The Proceedings of the last Meeting* were confirmed.

1690. *Roads.*—The Honorary Secretary stated that he had seen the Assistant Engineer since last meeting. On road 38 instructions had been given to build up the cattle track near a bridge between miles 4 and 5. The meeting hoped that the track at the Kaneambetta Bridge would be built up, as it is a danger to traffic, and a way down to the river for bandy bullocks made elsewhere.

1691. *Town Nuisance Act.*—Read letter from Honorary Secretary to Deputy Collector, and reply promising to support our request to have the Act applied to Meppadi.

1692. *Liquor Shop near Kotapadi.*—Read letter from Deputy Collector stating that the license for this shop had been cancelled, and reply of Honorary Secretary thanking him for his action.

1693. *New Member.*—Mr. C. H. Renouf was elected.

1694. *Extradition from Cochin and Travancore.*—Proposed by Mr. J. C. Parker, seconded by Mr. Powell: "That this Association do ask the Nilgiri Planters' Association to join us in petitioning Government to grant us extradition under Act I of 1903 from Travanccore and Cochin." —*Carried.*

The Honorary Secretary was instructed accordingly.

1695. *Hybridisation of Coffee: Proposed Experimental Plot near Coonoor.*—Proposed by Mr. Parker, seconded by Mr. Powell: "That the Delegate to the U.P.A.S.I. meeting be empowered to grant up to Rs.50 to the fund on the understanding that other Associations are doing the same." —*Carried.*

1696. *Experiment Plots.*—Read letter from Mr. Anstead. Ths Honorary Secretary stated that he had no information about any plots in Wynaad; and none of the members present were working any. Other members are asked to communicate with the Honorary Secretary as soon as possible on the subject.

1697. *Meeting of the U. P. A. S. I.*—The list of subjects was considered.

Scientific Officer's Tour.—The following resolution was proposed by Mr. J. C. Parker, seconded by Mr. Bownass and carried: "That this Association, fully recognising the immense amount of travelling that has to be done by the Scientific Officer, and having no special work for him in this District at the moment, does not press for a visit from him during 1911-12 unless any unforeseen emergency crops up. If such emergency happens, we as subscribers to the fund are of opinion that Mr. Anstead would help us by a personal visit."

1698. *Meetings.*—The Association thinks that one U. P. A. S. I. meeting a year is sufficient.

1699. *Green Tea Bonus.*—The meeting resolved to persist in asking the Cess Committee for this.

1700. *U. P. A. S. I. Exhibition.*—Members present promised to send exhibits.

1701. *Planters' Benevolent Fund.*—The attention of Members is again called to this.

1702. *Non-Service of Warrants.*—The delegate was instructed to press for redress as strongly as possible.

1703. *Coffee-Stealing Prevention Act.*—Letters have been received from the Collector of Malabar, the Deputy Collector of Wynaad, the Police and the U. P. A. S. I. asking for opinions as to what modifications of the rules and statements required under this Act are advisable; these statements are not now required for statistical purposes, but only for working the Act.

Read reply from Honorary Secretary stating he had put the subject down for discussion; but that he thought the Police and Magistracy who had to administer the Act were in the best position to judge what form of statement would be most useful. He suggested that the questions about the number of coolies employed should be omitted. He also asked for a copy of the judgment in case 2/11 Kalpatty Police Station Coffee parchment robbery. The copy has not yet been received. The Honorary Secretary's letter was approved.

1704. *Markets.*—Read letter from Deputy Collector asking for suggestions as to opening new markets in Wynaad or improving existing ones. The meeting had no suggestions to make.

1705. *Sanitary Works.*—Read letter from Deputy Collector asking for suggestions as to above. The Honorary Secretary was instructed to reply.

Among papers laid on table were the Report on Nilgiri Parks and Gardens, a pamphlet on Potato Crops, and I. T. A. Circulars.

A vote of thanks to the Chair terminated the Proceedings.

(Signed) H. ATZENWILER, *Chairman.*
(,,) C. E. ABBOTT, *Hon. Secretary.*

Coorg Planters' Association.

Minutes of the Proceedings of the Annual General Meeting held in the Bamboo Club, Pollibetta, on Friday, July 7th, 1911.

PRESENT.—Messrs. Mann, Hume, Tweedie, W. R. Wright, Prager, Achard, Shaw, Cox, Gerrand, Macrae, Grant, Clarke, J. W. Finlayson, Jackson, R. Hamilton, Grove, Pearse, Dickinson, Newbery, Breithaupt, Tipping, Mahon, Bracken & W. M. Ball, Honorary Secretary.

Mr. H. G. Grant was unanimously voted to the Chair.

The result of the Ballot for Officers was: *President*—C. E. Murray-Aynsley, Esq., *Honorary Secretary*—W. M. Ball, Esq.

COMMITTEE.

North Coorg.	*South Coorg.*
G. R. Pearse, Esq.,	A. H. Jackson, Esq.
J. W. Irwin, ,,	F. Macrae, ,,
H. M. Mann, ,,	H. G. Grant, ,,
C. G. Maclean ,,	F. W. Gerrard, ,,
J. A. Graham, ,,	W. A. F. Bracken ,,
W. E. Tweedie, ,,	E. L. Mahon, ,,

Messrs. W. Prager and P. M. Wilkins were elected Members of the Association.

The Honorary Secretary and Mr. P. G. Tipping were elected delegates to the U. P. A. S. I. meeting to be held in August next; and it was arranged that there should be a meeting of the Committee, to be held in the Travellers' Bungalow, Sidapur, on Friday, August 4th, to go through the U. P. A. S. I. agenda paper.

THE HONORARY SECRETARY'S REPORT.

The Honorary Secretary read the following report:

Gentlemen,—As you are all aware of the sad circumstances which made a new Honorary Secretary necessary, and as I have had no time to look up the records, I hope you will excuse a very short summary of the year's work.

The accounts are on the table, and I shall ask you to pass them at our next meeting. In future I hope to have the accounts circulated before our Annual General Meeting. As the whole subject of Finance must be gone into in connection with the Scientific Officer's Assistant scheme, I will not detain you on this subject.

Roads and Communications.—Our main roads have been kept in fair order, and the advent of the motor car has led to many of the bad corners being improved. The system introduced by the Executive Engineer of having mile coolies along the road and, where circumstances admit, under the supervision of the planter to whose estate they belong has brought about a great improvement. We have heard nothing more of the Motor Transport Co., but motor cars have been increasingly available for hire. On the other hand there have been many complaints as to the miserable state of the Tonga Service ponies. We had during the year occasion to complain of the bad state of the Mysore Road from the Coorg boundary. I hear there is some improvement here. Our interests are well looked after on the District Fund Board by our representatives, Mr. A. H. Jackson and Mr. J. A. Graham, and they will soon, I hope, be able to tell us of the opening of the Suntikoppa-Sidapur Road and the commencement of the Sidapur-Pollibetta Road. The District Fund Board is also doing good work in opening out cross roads and bridle paths.

Coffee-Stealing Prevention Fund.—Mr. Macrae informs me no thefts were reported and no rewards were paid during the season.

The accounts show a balance in hand of Rs.68-9-9.

Pepper-Stealing Prevention Fund.—Mr. Bracken has sent me the accounts, which show a balance in hand of Rs.94-12-0. A reward of Rs.20 was paid on the conviction of a thief, but Mr. Bracken tells me he had some doubts about paying this, as the theft did not occur in Coorg. I am, however, sure the meeting will support him.

General.—We lost during the year through the death of Mr. R. D. Tipping, our able Honorary Secretary, 1 member; and I now propose Mr. W. Prager and Mr. P. M. Wilkin as new members. The Association will then consist of 50 members.

Scientific Officer's Assistant.—This led to some discussion, the general opinion of the meeting being in favour of obtaining an Assistant to the Scientific Officer for Group 1, *viz*: North and South Mysore and Coorg, if sufficient Funds could be raised.

On the suggestion of the Honorary Secretary it was resolved that, as all members receive a copy of the *Planters' Chronicle*, it is unnecessary to have the Proceedings separately circulated.

A vote of thanks to the Chairman and Honorary Secretary closed the meeting.

North Mysore Planters' Association.

Proceedings of the Quarterly General Meeting held at Balehonnur on June 26th, 1911.

PRESENT.—Messrs. E. C. Bolton (Vice-President), C. H. Browne, C. Danvers, R. G. Foster, C. S. Crawford, H. Pilkington, F. J. Parton, C. H. Trevor Roper, L. P. Kent, and A. F. Evetts (Hon. Secretary).

Before commencing the business of the day the Vice-President and Mr. C. H. Browne addressed the meeting at some length regarding the lamented death of Mr. R. D. Tipping, Chairman of the U. P. A. S. I., Mr. Browne particularly pointing out that it was hardly recognised what a good and thorough man Mr. Tipping was.

The feeling of the meeting was most sympathetic and condoled with Mrs. Tipping and her family in their sad bereavement.

Scientific Officer Scheme.—A long discussion took place regarding this scheme.

The Chairman's Memorandum concerning the proposed Scientific Department, and the Association acreages were gone into and resulted in the following resolution being unanimously passed :—

> 'That our Delegate to the U. P. A. S. I. meeting in August next be 'authorised to guarantee in addition to (1) our Annual Subscription 'to the U. P. A. S. I., Rs.460, (2) the guaranteed Scientiffic Officer 'Fund Subscription Rs.600, (3) Laboratory up-keep Subscription 'Rs.115, a further minimum sum of Rs.3,000 per annum for a period 'of 5 years towards providing an assistant to Mr. Anstead who shall 'devote himself entirely to planting problems in Mysore.'

Read letter dated May 20th, 1911 from Mr. R. D. Anstead re Blister Blight on Tea.

Election of Delegate to the U P. A. S. I. Meeting.—Mr. C. Danvers was elected to represent this Association.

Read letter from the Secretary, U. P. A. S. I., dated June 16th, fixing the date of the Annual Meeting—August 28th—and preliminary draft of the agenda.

Proposed by Mr. C. H. Browne and seconded by Mr. C. S. Crawford :

> 'That as in the opinion of this Association the long intervals 'between the meetings of the U. P. A. S. I. result in a loss of 'interest in and knowledge of current subjects, and with a view 'to expediting the transaction of business of importance, it is 'desirable that half yearly meetings should be held.'—*Carried unanimously.*

The Honorary Secretary was directed to communicate the above resolution to the Secretary, U. P. A. S. I., and ask him to add this subject to the agenda.

Labour Difficulties.—Read letters from the Hon. Secretary, South Travancore P. A., dated 17-4-11 and 10-5-11, enclosing a copy of a resolution passed at their meeting held on the latter date.

After some discussion the following resolution was passed : 'That 'this Association notes with surprise that the S. T. P. A. should 'have passed their resolution after receiving the information 'asked for by them in their letter of 17-4-11. It is obvious that 'when this Association framed its resolution on the matter it 'referred to a specific case.'

Labour Agencies.—Nothing further has been recorded.

The Bababudin P. A.—Read letters from the Hon. Secretary dated 27-5-11 and 19-6-11.

Resolved: 'That this Association regrets it is unable to accede to 'the request of the Bababudin P. A. to hand to them any 'portion of the Reserve Fund of this Association to which 'certain members who have seceded lay claim. The members 'of this Association as Trustees of the Reserve Fund do not 'consider they have authority to entertain any such claim.' —*Carried.*

Kalasa Telegraph Office.—Read correspondence on this subject. The matter is still under enquiry.

Sanderson Ward Rules.—Read copy of Mr. E. M. Playfair's letter forwarded by the Hon. Secretary, S. M. P. A.

The suggestions made therein as to the alterations in the rules were agreed to.

Hybridisation of Coffee.—Read U. P. A. S. I. circular No. 37/11.

This Association guarantees to pay its share of the cost of opening an experimental plantation.

U. P. A. S. I. Exhibition.—Read U. P. A. S. I. circular No. 36/11; contents noted.

(Signed) A. F. EVETTS, *Hon. Secretary.*

The recent tendency of prices of coffee has been in favour of sellers, owing to the increased activity in the demand. Fresh purchases have been necessary on the part of the trade, who have allowed their stocks to dwindle to a low level. Total visible supplies, although over 2,000,000 bags less than at this time last year, have not diminished so much as was expected, and it is evident that the world's consumption is affected by the higher prices ruling. The wide divergence in values which for long existed between Santos and European markets has disappeared, and a fair business on c. and f. terms has since transpired. The stock in Santos is much below that of a year ago. At present there are no indications of quotations becoming modified, but whether they will hold when the receipts in Brazil begin to increase, as they are expected to do at any time, remains to be seen. The mild descriptions of coffee are relatively cheap compared with Brazil, and little more of them remains to be offered, prior to the arrival of the new crops towards the close of the year. . . . It is much to be hoped that the suggested campaign to push the sale of coffee in this country will meet with success.—*The Grocer.*

H. M. Vice-Consul at Caracas (Mr. G. B. Gilliat Smith) reports that an exceptionally good coffee crop is announced for this year in Venezuela. The critical period in the growth of the bean, *viz.*, the 'setting' of the blossom, has been satisfactorily passed, and it is stated with confidence that the crop this year will be about twice as large as that of last year (which was estimated at 600,000 sacks of 60 kilogs.), and will be considerably more abundant than any for the last six years. The shipment of the coffee will begin in October next, and will extend till about the following March. The greater part of the coffee exported from the Caracas district goes to Hamburg, the Maracaibo district sending to the United States. In the opinion of many well-informed persons in Caracas, the abundance of the crop of coffee in Venezuela is by far the most important factor in the general prosperity of the country.

INDIAN TEA CESS COMMITTEE.

Advertising in America—1910-11.

MEMO :—The following report by Mr. R. Blechynden, the representative of the Indian Tea Cess Committee in the United States, upon the work done during the fourth quarter of the Season 1910-11, has been published for general information.

India Tea American Advertising Fund.

Season 1910-11.

REPORT FOR FOURTH QUARTER.

I beg to submit my report for January, February and March 1911, the fourth quarter of Season 1910-11.

NEWSPAPERS.

2. No change has been made in the method of using newspaper advertising as the entering wedge when we take up a new centre. To be effective for this purpose and to clear the way for the specialty men, the advertisements have to be striking enough to arrest attention immediately. This is expensive and has to be carefully watched and controlled to maintain a proper balance between this and other forms of advertising to which we are committed.

SPECIALTY MEN.

3. Four men were employed during the entire quarter. In accordance with our custom, they were assigned to more southerly territory when the severe winter began in the States they were in at the close of the third quarter.

4. The places dealt with during the fourth quarter are in the States of Tennessee, Kentucky, Alabama and Georgia, all with a large coloured population. The more rugged and hilly sections are thinly peopled by a class known indifferently as Poor Whites, Crackers or Hilly Billies, reputed to be direct descendants from very early settlers and now living much as those did. The specialty men have curious stories of the astonishing ignorance of these people of anything outside their hills. Tea is practically unknown even to the men who keep store in little wayside cabins, though one of these proudly displayed his stock of a few ounces which he had for some years kept in a preserve jar, for possible demands in cases of illness.

5. In the cotton plantations country the only stores are those maintained by the planters, which carry certain staple articles for the negro hands and charge purchases against labour. In this section too, tea is practically unknown.

The small volume of the tea business in these country districts, make both local jobbers and their travelling salesmen alike indifferent to the work of introduction. At the best their support is perfunctory and if salesmen think they are being delayed on their routes by the specialty men, they may even become hostile.

6. Conditions in the cities and larger towns are more modern, so that the average sales for the quarter and the average quantity placed per sale comes out fairly well. There were in all 599 sales aggregating 15,145 lbs. an average of 25·3 lbs. per store.

DELIVERIES.

7. The deliveries reported by the jobbers included those held over on account of the holidays at the end of the third quarter, and are, therefore, in excess of the sales noted in the last paragraph. There were 689 deliveries, amounting to 17,825 lbs. which gives an average of about 25·8 lbs. per store. As pointed out in other reports, deliveries and sales must show a

difference quarter by quarter, as the deliveries are not made till some time after the sales, when convenient shipping lots can be accumulated.

POST CARDS AND SAMPLES.

8. The distribution of post cards and samples shows an increase, due to those held over on account of the Christmas-holidays in the third quarter, when mails were overloaded.

There were mailed :—	Post Cards.	Samples.	Total.
In January	32,063	9,900	41,963
„ February	23,088	6,209	29,297
„ March	24,363	7,886	32,249
	79,514	23,995	103,509
Against 1st Quarter ...	112,773	35,562	143,335
„ 2nd „ ...	117,882	44,624	162,506
„ 3rd „ ...	67,615	14,679	82,294

9. The reduction in the output of advertising matter in this quarter was anticipated in my last report, and had it not occurred expenditure could not have been kept within the limit of the estimate for the season. As it was, this was achieved with the narrowest of margins.

GENERAL.

10. There can be no question as to the pioneering character of the work done during the quarter. While much territory is being covered the reports and the small apparent results are very discouraging; still when viewed as a whole there is evidence that the effort will prove in time worth while.

So far as the country towns and villages are concerned, no outsiders have tried to do anything with them before and such small demand as there has been for tea has been met by grocers getting the merest rubbish from their supply houses. There is not sufficient tea used in such places to tempt specialists to visit them, as their sales would not pay their way. The grocers who, tempted by the advertising offer, have bought India tea will no doubt try and sell it, and as their sources of supply, the jobbing houses, have now also got stocks, further movement may be expected.

11. In the larger towns prospects are much better. These are being worked by the packet tea houses, who now realize that our general advertising is of assistance to them and are anxious to see us work other cities, where they can follow up.

In some places representatives of New Orleans houses have been calling on jobbers with samples of "the tea being advertised" and the trade in the cities generally is awakening to the possibilities of tea. New Orleans with cheap water carriage from New York competes with St. Louis in the Southern States.

12. In the last quarter of last season a household show was held in this city, in which we took part, indirectly, through a jobbing house. It proved to be a success for all concerned and was repeated this season at the same time, *viz*:—in the last two weeks of March. We made precisely the same arrangements as we made last season, paying our share of expenses for the booth, help, etc., and obtaining the sole right to serve tea in the Show. Again this season a large space was set aside by the management for the serving of meals by the various Clubs, Charity Organizations, etc., run by St. Louis ladies, who retained the proceeds of their sales for the Organizations. Only temperance beverages are served in such cases, and the coffee and tea were supplied by the booth in which we were interested. The space was railed off and described as the India Tea Garden in

prominent signs and referred to under that name in the newspapers by the press agent of the Show.

13. It is difficult to appraise the value of these forms of advertising, but such shows give opportunities for serving tea properly made and demonstrating is conceded to be a successful method of making customers. For this reason we responded to an application from the Y. W. C. A. of the University of Columbia, Missouri, and in connection with a Fund Raising Bazaar they held, presented them with a liberal supply of tea samples we distribute, for them to sell. The condition was that they should make and serve the tea while the bazaar was open. They wrote subsequently expressing their thanks and stating that they had sold all the samples.

14. As I submit an annual report at this time, covering the whole season, other matters which might otherwise have been included under the heading of this paragraph are dealt with there.

EXTRACTS FROM ANNUAL REPORT FOR SEASON 1910-11.

The quarterly Reports have given details of the work in progress, so it is not necessary to give here more than an outline of the year's operations.

Newspapers.

As work is taken up in each new centre, the local newspapers are used to draw forcible attention to India tea. This paves the way with the grocers to be visited and frequently starts inquiry for the tea, even before salesmen can get round to visit the trade. After a sufficient number of grocers have purchased stocks and the trade has been visited, the grocers selling India tea are advertised by name.

Post Cards and Samples.

The basis of this direct form of advertising is the mailing list prepared by the grocer, giving the names and addresses of those to whom he desires this advertising to be sent. These lists come to us from the jobber with a guarantee that the tea in question has been delivered, and the jobber on the other hand guarantees to the grocer that the specialty man's promise of advertising will be kept.

Where the jobbers' salesmen get interested in tea, they continue the work after the specialty men leave them. . . .

The falling off in sales and deliveries in this season compared with the previous one was due to several causes.

In the early part of season 1909-10 a certain proportion of India green tea was placed (see the first two quarterly reports 1909) but since then there has been none used nor indeed any available.

In this season (1910-11) we have covered the country places much more closely and have not dealt with only the larger towns. This is referred to in another portion of this Report.

Of the tea placed in the previous season a fair proportion was for future delivery, but with the advance in price and the excitement in the coffee market grocers and jobbers became less inclined to make commitments. The advices of deliveries do not include futures; but these affect the specialty men's returns and the number of names in the mailing lists.

The increase in the number of postcards sent out is due to our having settled down to an uniform system, whereas in the previous season (see sixth paragraph of Report for that year) a similar uniformity had been reached. As seasons overlap only those mailing lists are counted that were taken in hand before 1st April 1911.

Territory.

When the last annual Report was submitted active work was being done in the States of Kansas, Arkansas and Indiana. During the current season the balance of the State of Kansas was covered so far as the more

populated areas are concerned, leaving the Western strictly farming portion undealt with, as bad crop made work there unattractive to the jobbers. The contiguous State of Oklahoma was fairly well done, but the agricultural conditions were the same as in Kansas. Part of Iowa was covered from one jobbing centre which includes a few Illinois towns in its territory. In the winter the more Southern States of Kentucky, Tennessee, Georgia and Alabama were taken up and most of the more important places were actively worked, together with their tributary territory which occasionally led into Arkansas and Mississippi.

The system of working from various centres in each State is possible only under the system we have followed during this season.

Our previous experience was with jobbing houses, large and small, selling direct to the retail trade and forced by conditions of selling cost to visit only the larger cities over very wide territory covering many States. Such houses can sell tea in quite a fair quantity and must in relatively large quantities to pay the salesmen's heavy travelling expenses. They do not however cover any selected area thoroughly, and do not aim to do this. Some of the smaller jobbers we connected with did quite well in that way and others were unrealiable and since the joint work with Ceylon stopped it has been more than ever requisite to guard against substitution.

The plan of dealing with a central house of high standing which makes terms and arrangements with subsidiary jobbers has worked well, the one advantage I have found being that an extra profit has to be taken on the tea. This is a matter which adjusts itself in due time, as if the price is too high the retailer will place his next order with a competing jobber and we are interested mainly in the introduction of the tea. If it moves the grocer can be trusted to take care of himself in the matter of further supplies.

Iced Tea.

For the second summer we experimented with iced tea with the idea of bringing it into popular competition with other iced "soft drinks." The wide difference between the popular price of cold drinks and the cost of iced tea admits a good deal of waste in unused tea, and yet shows a large margin of profit. A pound of tea will make 16 gallons of liquid tea. Ice is about 20 cents a hundred pounds. Sugar about 5½ cents a pound. Cold drinks are retailed in Street stands at five cents for a three-quarter pint glass.

I found the main obstacle to be, rapid distribution to the Stands at a reasonable cost and having the receptacles kept clean, as fine particles deposited from the water and tea will rapidly spoil the fresh supply and make it cloudy. I have no doubt that the right man could make a profitable season's business with iced tea, as it is popular enough at meals during the summer months and were given without charge is very freely used. I do not purpose to carry on the experiment this season and am disposing of all the coolers and other materials.

The readiness with which people will drink iced tea served free is illustrated in two places we are connected with.

In previous Report mention has been made of a St. Louis Furniture Store we supply gratis with tea. In one of the display rooms the furniture is arranged to be used as a lounge and our tea is served here to their customers all the year round. It has become a feature of the Store and is frequently alluded to in their newspaper advertisements, the postcards they send out, etc. The crockery and teapots, etc., have the words India tea prominently displayed. Now that the iced tea season has come round again

we are taking care of the arrangements and on the experience of two previous seasons have to make provision for ten gallons of tea each day.

The one advertisement we were directly connected with in New York was referred to in paragraph 13 of the second quarter's Report, *viz.* :—a tea booth in a popular Department Store. This summer the same store will use the same method, as they state they found it useful. As their letter on the subject was received in March reference can be made to it here, though the regular iced tea season usually commences in June.

They wrote :—

"Before your first demonstration we did not handle a pound of India tea and now we are making it a hot rival of our Ceylon tea.

"We are sending you by mail an empty pound canister of which we ordered two thousand at a cost of ten cents each (the second order will cost about eight cents, making allowance for dies). We have been running this canister only a few months and will soon have to re-order them.

"We believe that this is the handsomest canister in the American market, and entirely designed by the writer. The native on one panel and other little points were suggested by illustrations given in the folder which you sent us.

"If you will kindly contribute the same amount as you did last year we can assure you that we will give your exhibit our utmost attention, doing the same as we did last year, furnishing a competent demonstrator during the Food Show, supplying samples, china, spoons, doilies, &c., and continue serving your tea during the summer months, this covers a period of not less than three months."

We are doing no other advertising in New York yet I am tempted to refer here to some remarks in a letter recently received from Mr. Williams, who places our newspaper advertising. He had been struck by the number of men he saw in restaurants taking tea with their meals and began a little investigation on the subject, he wrote :—

"I have gone into thirty restaurants and every one of them, except two, is serving our tea. Of course whether it is India or Ceylon I am not expert enough to know, but it is either India or Ceylon."

The attendants at these places told Mr. Williams that a great number of men now drink tea in the place of coffee and thus confirmed his own observation.

GENERAL.

. . . During the season we have made trial of another method of interesting a class known as tea peddlers. A great deal of the retail tea and coffee trade has been captured by this enterprising class. They have usually one or two stores, but get most of their business by house to house visit employing a large number of light waggons. They create trade by using the coupon system and other forms of gift enterprises. I hope to report on results before long.

During the latter part of the season the tea market has been affected by the selection of new standards under which teas are passed for admission in the United States. The new standards will exclude importations of artificially colored teas and while they did not become effective till the 1st May 1911, the action of the Board of Tea Examiners created such a brisk demand for colored teas on the spot that they were soon sold out. This season, therefore, marks the end of conditions that were unfavorable to makers of Indian uncolored green tea and they will have the opportunity of competing on more equal terms with China and Japan.

The Planters' Chronicle.

RECOGNISED AS THE OFFICIAL ORGAN OF THE U. P. A. S. I., INCORPORATED.

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THE U. P. A. S. I.

(INCORPORATED.)

The Chairmanship.

The Hon'ble Mr. J. G. Hamilton has been voted to the vacant Chair, and will preside at the coming Annual Meeting.

Coffee congensis, var. chaloti.

Advices from the suppliers in Europe state that it has not yet been possible to execute the order sent to them, the berries of the desired variety being scarcely ripe. The suppliers do not expect to receive the seed until a month or two later.

The International Rubber Exhibition, 1911.

Writing to the *Madras Mail*, " L. E. K." remarks *inter alia* :—

" What attracted me most was the South Indian stand, and a brief description of this will doubtless interest many of your planting readers. . . .

" The exhibits, which include several samples of Pará and Ceará rubber, pepper, coffee, tea, cardamoms, etc., and photographs, have been tastefully arranged in a handsome pavilion, and each visitor is presented with a neatly got up hand-book in which the history and progress of rubber in Southern India is described, special chapters being devoted to Malabar, Travancore, Cochin, the Shevaroys and Mysore. Among the most conspicuous exhibits I noticed a striking handrolled sheet of rubber from trees 4½ years old, sent by the Mooply Valley Rubber Company and the experts agree that there is not much in the Exhibition that equals it. There are several fine samples of Pará from the Orkaden River Co.'s Estate, from the Rani (Travancore) Rubber Company's Sittar Estate, and from the Kutikul Estate of the Mundakayam Valley Company. There are also some interesting samples of Ceará Rubber from the Maryland Estate on the Shevaroys. Coffee is shown (in bottles) from the Kesinvurthy, Sumpigay, Hatti and Kukkenmutti Estates, on the famous Bababudin hills in Mysore. The photographs represent various phases of rubber cultivation in different districts, and a specially interesting one shows a wash-away by the river on the Mooply Valley Company's Estate and the exposed roots of a 4½ year old Pará rubber tree. The photograph illustrates the remarkable depth of soil and the magnificent root development of the rubber trees planted thereon which cannot fail to result in good yields.

" Altogether, the Southern India section is in every way a credit to the Committee responsible for its arrangements, and especially to its capable and energetic Chairman, Mr. J. A. Richardson; and, in my opinion the good results it will bring about by attracting attention to the wonderful possibilities of the South-West Coast of the Madras Presidency as a rubber producing country will more than justify the expense it has entailed."

Scientific Officer's Papers.

LXXII.—"THE WHOLE ART OF RUBBER GROWING," BY W. WICHERLEY, F.R.H.S., PUBLISHED BY THE WEST STRAND PUBLISHING CO., LTD., LONDON, PRICE 5s. NETT.

The Essays on Rubber from the pen of Mr. Wicherley, which have appeared from time to time during the latter part of 1910 and the early part of 1911 in "*The Rubber World*," with the addition of a little fresh matter, have recently been published in book form under the title of "The Whole Art of Rubber Growing." This title is somewhat unfortunate, for those who are actually struggling with the many problems connected with Rubber Growing know that the 'whole art' of that fascinating and profitable cultivation cannot be found within the covers of a book, nor indeed is it yet known to any man.

Mr. Wicherley's book is somewhat disappointing; it contains very much of interest, but little that is new, and much of it consists of acknowledged quotations and opinions of those who have 'borne the heat and the burden of the day'; nor does the author evidently know anything of the progress which has been made in South India in recent years, an ignorance which is especially noticeable when he is dealing with the subject of Ceará rubber.

Hevea brasiliensis is first of all dealt with in the course of three chapters, and a short account is given of the difficulties of cultivation and tapping which were experienced and overcome in the early days of its introduction into the East through the medium of Kew. Yields and tapping methods are reviewed, and the results of the many experiments carried out at the Government Gardens in Ceylon are summed up as follows :—

"Three important discoveries in regard to tapping Hevea were made from the Heneratgoda experiments, *viz.*, (1) that high tapping was not necessary, and that it was moreover conducive to the production of non-coagulable latex; (2) that tapping on alternate days, with a maximum of 120 tappings, gave best results; (3) that bark renewal of excised trees occurred at the rate of ¼ inch. in nine months, providing the cambium had not been pierced.

"Upon these discoveries are based the leading principles which to-day govern the exploitation of the rubber tree in the Mid-East, and although the leading plantations are doing well under the ordeal, and in the mass increasing heavily their monthly outputs, the wiser heads in the industry are nervously asking "Will it last?" Shortly stated, the tapping principles referred to are: (a) Tapping to commence when the tree has gained a girth, three feet from the ground, of 17 inches; (b) no tapping operations to be carried on at a point higher than six feet from the ground; (c) tapping by bark excision of at least a quarter of the circumference of the tree in one season.

"If disaster ever does come it will be brought about by the extension of the latter principle by greedy and impatient speculators, many of whom, having to justify inflated estimates in their prospectuses, are already planning to double the yield of their young trees in the first year of working by excising the bark of a full half of the tapping area, and trusting to luck for what may happen in consequence!"

For planters in South India, however, the most interesting part of this book will be the three chapters dealing with Ceará rubber, (*Manihot Glaziovii*) which was added to the Kew catalogue in 1876 and introduced from Kew to Singapore, India, and Ceylon in the following year. In the Mid-East it grew rapidly and well, and much was hoped for it.

Owing, however, to the lack of knowledge in tapping it was rejected about 1883 and large areas of it were grubbed up. In India many fine trees were destroyed which, had they been allowed to stand, would now be a great source of profit.

"Fortunately for the future of *Manihot Glaziovii* in the Mid-East a different story can be told of it in the plantations of Southern India, Burma, and East Africa, where the plant had also been introduced. In Madras (in the Nilgiris) the Manihot soon proved its sterling qualities planted at a height of 2400 feet. In two years it had attained a stature of 30 feet, and the following year presented a girth 3 feet from the ground of over 20 inches, and was therefore ready for tapping. Similar results were experienced in South Malabar, where at Nilambur the tree was impatient to produce itself everywhere.

"With regard to Mysore, Mr. J. Cameron has placed on record an interesting statement of his own experience with the Manihot in his "Report on the Lal-Bagh Gardens," dated April 1886: "Further experience" (he tells us) "has justified my opinion that the Ceará Rubber tree is adapted to the climate. Its cultivation progresses so favourably that every encouragement is offered to plant on an extensive scale. The tree loses its leaves during the driest period of the year, and is thus preserved in a semi-dormant state until the vernal showers excite growth again. Judging from our own experience, the Ceará rubber tree requires no pampered treatment, although, like most plants, it prefers a little kindness to starvation and utter neglect. It grows very rapidly in vegetable mould, but, planted in any ordinary soil at the break of the south-west monsoon, the seedling will shift for itself, and possibly have taken such a hold on the ground that no artificial watering is required during the subsequent dry season. This is what I have done with a hundred seedlings six months old on poor gravelly soil, and I am certain that nearly the whole will burst forth into fresh growth when the rain sets in."

Mr. Wicherley is an adherent of close planting, both for the Hevea and Ceará, and he recommends even as many as 600 of the latter trees to the acre. He has much of interest to say about tapping methods, but is evidently totally unaware of the results which have been obtained in Coorg during the last few years where practically all difficulties have been overcome without the aid of the pricker. The author concludes :—

"The best altitude for Ceará rubber is from 800 feet to 3,700 feet; it requires to be closely planted—at least 600 to the acre. It does not like its "feet wet," or, in other words, it requires full measure of 52 inches of rain, but delights in four or five months of dry, hot weather. It is rather intolerant of wind, and, being a very quick grower, will shoot from 12 to 18 feet in a year from seed at stake! It is a good plan, as already stated, to provide wind belts on all exposed positions by planting the Darien Castilloa rubber, which is the Castilloa now growing in Ceylon.

"After the ground is cleared, all dead wood should be burnt; then follows the planting, made for preference direct from seed at least two years old and which has undergone six or seven days' soaking in tepid water to soften the tough outer coatings. In about eighteen days the cotyledons make their appearance. Thereafter growth, under normal conditions, is rapid and continuous, and with a plentiful falling of the weeds and undergrowth around the young roots, as mulch and top-dressing, the trees will have no difficulty in attaining during the first year sufficient stature to ensure their arriving at the tapping stage in the third year from planting.

"There should not be the slightest difficulty associated with the tapping of this tree; yet throughout both Ceylon and Southern India planters unanimously agree that this difficulty does exist, and to such purpose that any attempt to exploit Ceará on the lines that the Hevea is exploited—*viz.*, by bark excision and herring-bone cuts, invariably results in the death of the tree. This is not surprising when we remember that the *Manihot Glaziovii* does not possess a bark that permits excision without endangering its very

existence. It possesses a twin-bark. The outer-one, which might be termed the 'mother' of the tree, is a thin but tough papery structure $\frac{1}{8}$-inch thick, while the other is merely a kind of semi-transparent green bandage that keeps the lactiferous vessels from swelling and bursting when exposed to the air and sun after the stripping of the 'mother' bark. It was the fashion with the Ceylon and Indian planters to take off the outer bark several weeks before attempting to tap the tree, with the result that their Cearás immediately 'sulked,' shedding their leaves prematurely, and ultimately going off into a long, long sleep which looked so much like death that destruction invariably followed without the poor tree having a chance to prove its latent vitality. Now it should be a cardinal principle in the exploitation of the Manihots that under no circumstances must the outer bark be removed without at once releasing the consequent tension of the tender inner bark by tapping the whole of the area thus exposed. The proper way to do this is 'jab' the tree with the recognised Ceará knife. This is a tool that may be handled safely by the most careless of coolies, inasmuch as it is provided with a 'shoulder' guard that absolutely forbids any possibility of damaging the cambium. The tree should be stripped from the bottom upwards, and one foot at a time. Such a stripping will permit of six tappings carried over a period of fourteen days. Thus the tapping period for the first part of the season may be said to last from fifty to sixty days. The second period occurs after the fall of the flower, and lasts about fifty days. Not more than forty punctures should be made at any one time, and where the latex is apt to flow very freely the exposed bark should be lightly dressed with a weak solution of acetic acid to promote instantaneous coagulation. Otherwise the fluid will run away over the unstripped bole of the tree, either to sheer waste or to become dirty and unsaleable scrap."

The rest of the book deals briefly with other varieties of rubber, the *Ficus*, *Castilloa elastica*, *Funtumia elastica*, and the new *Manihots*, and there are chapters on Interplanting, and Assimilative and Secondary Rubbers. Some useful figures are given bearing on the future prospects of the industry, and showing the average cost of laying out estates with both Hevea and Ceará. The book concludes with a chapter on the Soy Bean which is, in many ways, the most interesting of them all.

The secret of success with this crop is stated to depend upon careful attention to the following details :—

"The most suitable soil for soya bean is that of a light sandy nature, friable and easy to manipulate. It should be well cleaned and levelled, and inoculated by sowing broadcast four to five bushels of seed to the acre. The best seed for tropical areas is the yellow kind. In two or three days germination will have taken place, and in three weeks the grass should attain a stature of nine to twelve inches. The plant will then begin to branch, and in six weeks at the latest the flower begins to appear. It is at this period that the work of inoculation must be taken in hand, the operation consisting in ploughing in at once the whole of the growing crop. When this is done, the ground is again levelled, and the crop proper at once drilled in at a distance of six inches between the plants. Under this system the soil is thoroughly and effectively inoculated, and the crop, other things being equal, will mature in eight or nine weeks from the time of sowing."

Though I cannot agree with all the author's opinions and conclusions, at any rate under the conditions which obtain in South India, his book should be carefuly read by all rubber planters, especially those interested in Ceará ; though they will not find it contains by any means guidance to the 'whole art' of rubber planting, they will find in it much of interest and of use.

RUDOLPH D. ANSTEAD, *Planting Expert.*

DISTRICT PLANTERS' ASSOCIATIONS.

Mundakayam Rubber Planters' Association.

Minutes of a General Meeting held at Yendayar Bungalow on Saturday, July 1st, 1911.

PRESENT.—Messrs. J. J. Murphy (Chairman), R. Harley, J. R. Vincent, G. H. Danvers Davy, E. R. Gudgeon, A. C. Vincent, C. B. Hall, Hunnybunne, G. Atkins, J. D. Deane, E. E. Eyre, Byrne, M. Smith, and F. H. Hall, (Hon. Secy.)

Visitors:—Messrs. K. E. Nicoll, P. J. Langham, McLain.

A vote of sympathy with Mrs. Tipping on the death of her husband was recorded.

The Minutes of the last meeting were taken as read, and the minutes of the Committee Meeting held to discuss the 'Renard Road Train' were circulated and confirmed.

Scientific Officer.—Proposed by Mr. Harley and seconded by Mr. Davy: "That subject to 90% of the acreage agreeing to subscribe on the basis of the Chairman's letter of 11/4/11, Messrs. King and Joscelyn in conjunction with a Local Committee be instructed to draw out rules and an agreement similar to those for the European Doctor. That a Committee consisting of Messrs. G. H. Danvers Davy, J. R. Vincent, R. Harley, Hon. Secy., and Hon. member Mr. Anstead be appointed and that Messrs. J. J. Murphy and J. A. Richardson be authorised to select and appoint a man."

Mr. J. R. Vincent proposed and Mr. A. C. Vincent seconded the following amendment:—"That a Committee of seven including the Chairman, Hon. Secy., and Mr. Anstead be selected in draw up, with as much detail as practicable, the general outline of the Sc. O. Scheme showing financial and other details."

The amendment being put to the meeting was lost, and the original resolution was carried unanimously.

European Doctor Scheme—Proposed by Mr. Harley and seconded by Mr. J. R. Vincent: "That Mr. Murphy be asked to be trustee," to which he consented.

Roads.—Kadamankolam-Kuppakayam Road.—Proposed by Mr. Harley and seconded by Mr. Gudgeon: "That Government having already built Manikal bridge and made a stipulation that it shall be kept in repair for public use, a grant for the section of the road between the 35th mile and the bridge be asked for."—*Carried.*

Resolved: "That the attention of Government be drawn to the disgraceful state of the Mundakayam-Kottayam Road at the 5th mile."

The Hon. Secretary was requested to send a reminder to Government about the Lalam-Erratapettah Road.

Poonyar Road.—The Honorary Secretary was instructed to write and ask Government to give estimates for the above road.

Madras Labour Act.—With reference to resolution passed at the Annual Meeting in January, the Chairman said that the Hon. Secretary had applied for copies of the Act and had been unable to obtain them.

Mr. Vincent gave notice that at the next Meeting he would bring forward a resolution in favour of the Labour Act being introduced into Travancore.

Labour Rules.—Mr. J. R. Vincent proposed and Mr. A. C. Vincent seconded: That after Rule (3) the following should be added:—"The estate from which a cooly absconds shall be bound to refund the advance given by the first estate if requested to do so. The claim on the services of the cooly as per rule (3) shall then be relinquished."'

On being put to the Meeting the Resolution was lost.

Mr. Vincent proposed and Mr. Deane seconded: "That at the end of Rule (4) the words 'Or the option for claiming its advance from the estate to which the Kangany has absconded' be added."

The above Resolution was put to the meeting and was lost.

The following New Rule was agreed to:—'That from this date no Kangany shall be allowed to keep or supply coolies to two estates without the express permission of the first employer and in the event of his having received an advance from a second estate it shall be recovered out of any balance he may have on the estate to which he really belongs after all claims against him there are settled.

Post Office.—With reference to letter No. 288 dated 6/4/11 received from the Superintendent of Post Offices, the Hon. Secretary was instructed to write and say that Madras mails were more important to planters in Mundakayam.

The Honorary Secretary was also instructed to write and thank the Superintendent of Post Offices for the prompt way in which he had met the wishes of the planters in the transfer of the P. O. from the 33rd to the 35th mile.

Mr. Harley proposed and Mr. Davy seconded: 'That the attention of the Superintendent of Post Offices be called to the length of time it takes for a parcel from Madras to Colombo to reach Mundakayam and to ask if anything can be done to accelerate the service.

The Honorary Secretary was requested to write and ask that telegrams should be delivered to all Bungalows within 3 miles radius of the P. O.

U. P. A. S. I., Election of Delegates.—Mr. Vincent was elected delegate and Rs.150 voted for his expenses.

He was instructed (1) To press for Legislation dealing with the prevention of Rubber thefts only, tea and other products not being included.

(2). To support any resolution brought forward in favour of Standardisation of Weights and Measures.

(3). Under the heading of 'Labour' he was to request the Planting Member to call for information from Government as to the number of emigrants going to and returning from Penang and F. M. S. and the number who die there and what facilities were afforded to coolies returning;

and to propose that the Planting Member bring before Government the necessity of Extradition in the service of Criminal Warrants dealing with Labour Acts in the Native States.

It was decided that the Association's subscription to either the U. P. A. S. I. or Scientific Officer Fund should not be increased.

The Chairman then said that as he hoped to leave for Home in August or September he would after the meeting hand over office to Mr. Harley (Vice-Chairman).

Mr. Vincent then proposed a vote of thanks to the Chairman for the services he had rendered on behalf of the Association while in office.

The next Meeting will be held at Mr. Wilson's bungalow, Kuppakayam Estate, on the first Saturday in October.

(Signed) J. J. MURPHY, *Chairman.*

(„) FRED. H. HALL, *Hon. Secretary.*

LOCAL LABOUR RULES.

Labour (Tamil) Rules passed at meeting held on 16th January 1909.

1. No Kangany or cooly to be taken on from an estate in this District except on a discharge note.
2. Discharge notes must be signed by the Manager of an estate or by his European Assistant.
3. The estate from which a cooly absconds has first claim on him for a period of three months even should he go to his village before working on another estate.
4. The estate from which a cooly absconds has first claim on him for a period of twelve months.
5. In regard to coolies advanced at their villages by the Kanganies or agents of two Estates:
   (*a*) The estate making the prior advance has first claim on the cooly provided that the second advance is given within three months of the first.
   (*b*) When the second advance is given three months after the first, the Estate to which the cooly is brought has the first claim on him.
6. The estate with first claim on a Kangany or cooly having recovered the advance made, the Kangany or cooly must be sent to the estate having second claim or the debt to it paid.
7. New Rule agreed to on 1st July 1911 :—

   That from this date no Kangany shall be allowed to keep or supply coolies to two estates without the express permission of the first employer and in the event of his having received an advance from a second estate it shall be recovered out of any balance he may have on the estate to which he really belongs after all claims against him there are settled.
8. Disputes under these rules to be settled by the Committee of the Association, who may appoint arbitrators.

Anamalai Planters' Association.

Proceedings of the Half-yearly General Meeting held at the Puthototum Bungalow at 2. p.m. on Tuesday, the 11th July, 1911.

PRESENT.—Messrs. C. H. Brock (Chairman), H. W. deSalis, J. H. J. Jones, E. W. Simcock, A. C. Cotton, E. N. House, M. B. Pollard Urquhart, S. W. Hoole, and C. R. T. Congreve (Hon. Secy.).

By Proxy, J. O. K. Walsh.

The following new members were elected :—

Messrs. E. N. House, M. B. Pollard Urquhart, S. W. Hoole, J. H. Robinson, and E. Haden.

The Meeting expressed its regret at the loss the U. P. A. S. I. had sustained by the death of the late Chairman, Mr. R. D. Tipping, and resolved that a message of condolence be sent to Mrs. Tipping.

It was also resolved that a letter of condolence be sent to Mr. R. D. Anstead on the death of his only son.

The Meeting expressed its horror at the murder of the Collector of Tinnevelly and sympathised with Mrs. Ashe in her sudden bereavement.

Delegate to the U. P. A. S. I. Annual Meeting.—Mr. G. L. Duncan was elected as the Association's delegate to attend the Annual General Meeting of the U. P. A. S. I. in August.

The Honorary Secretary was requested to give Mr. Duncan the necessary instructions.

Meetings of the U. P. A. S. I.—The delegate was instructed to support the North Mysore Planters' Association's resolution for half-yearly Meetings.

Toll-gate Charges.—Owing to the refusal of the Executive Engineer, Coimbatore, to readjust the toll-gate charges on four-wheeled vehicles passing through Vananthorai road toll-gate on the Anamalai Ghât road, the Association delegate to the U. P. A. S. I. meeting was instructed to request the U. P. A. S. I. to address Government on the matter.

Labour Recruiting.—Mr. Martin's map was examined with interest.

The delegate to the U P. A. S. I. meeting was requested to again press the acceptance to Mr. Brock's Registration Scheme of 1909, and the unanimous opinion of the Association is that this or some similar scheme is the only feasible solution of the present labour difficulties.

Scientific Officer's Programme.—The delegate was instructed to request Mr. Anstead to visit the Anamalis about January 1912.

Hybridisation of Coffee.—The Meeting was of opinion that the financing of the proposed experimental plot should be left over for discussion at the U. P. A. S. I. meeting, the delegate being instructed to vote in favour of its being financed by the U. P. A. S. I.

The U. P. A. S. I. Exhibition.—Members desirous of sending exhibits were requested to post them direct to the Secretary, U. P. A. S. I., 25, South Parade, Bangalore.

Assistant for the Scientific Officer.—After great discussion the Association was unable to arive at any definite opinion on this subject at present, owing to non-representation of large interests.

Resignation of Chairman, U.P.A.S.I.—The Honorary Secretary was instructed to write to the Secretary, U. P, A. S. I., recording the Association's vote in favour of the Hon. J. G. Hamilton acting as Chairman at the forthcoming U. P. A. S. I. meeting.

Roads.—The Honorary Secretary informed the meeting that no reply had yet been received to his letter dated 9th June addressed to the Secretary to the Government, D. P. W.

Non-service of Warrants.—The Honorary Secretary was requested to write to the District Superintendent of Police, Coimbatore, complaining of non-service of warrants on the part of the local police, giving details of the specific cases mentioned at the meeting.

Hospital.—Read the Honorary Secreatry's letter dated 15th June 1911 to the President of the District Board and the latter's reply dated 3rd July 1911.

The Meeting noted with great disappointment that the building of the hospital had been suspended for so long a time and that there seemed very little prospect of its commencement. A hope was expressed that the District Board would endeavour to accelerate the construction with all speed.

Papers laid on the table :—

U. P. A. S. I. Circulars.
Correspondence.
Accounts.

With a vote of thanks to the Chairman the meeting closed.

(Signed) C. H. BROCK, *Chairman.*
(„) C. R. T. CONGREVE, *Hon. Secretary.*

Central Travancore Planters' Association.

Minutes of the half-yearly Meeting of the above Association held at Glenmary Bungalow on Saturday, the 15th July, 1911, at 10 a.m.

PRESENT.—Messrs. W. H. G. Leahy (Chairman), F. Bissett (Vice-Chairman), J. F. Fraser, K. E. Nicoll, C. W. Lacey, W. G. Haslam, R. E. Haslam, A. R. St. George, F. E. Thomas, T. A. Kinmond, J. H. Cantlay, E. G. Cameron, J. H. Ellis, C. C. Evans, and J. S. Wilkie (Honorary Secretary).

The notice calling the meeting having been read, the Chairman said :—

" Gentlemen,—Before we proceed with the ordinary business of this meeting I would propose that this Association records with deep grief the death of the late Chairman of the U. P. A. S. I. and wishes to convey its sympathy to Mrs. Tipping and relations, and that the Honorary Secretary do forward the resolution to the Coorg Planters' Association."

This was passed in silence, all members standing.

The Minutes of the last Meeting were taken as read and confirmed.

Correspondence.—Read letter No. 167 of 30/6/11 *re* examination of coolies passing through plague-infected areas on their way to Estates. Resolved : " That the Honorary Secretary do write intimating the Association's willingness to carry out the suggestions and get further information."

Read letters No. 4381 of 29/5/11 and No. 2796 of 12/6/11 from the Chief Secretary to Government.

Read letters from the Secretary, U. P. A. S. I., Nos. 22/11 to 41/11. The Meeting considered half-yearly Meetings of the U.P.A.S.I. inconvenient and unnecessary.

Read letters from Scientific Officer Nos. 237, 301 and 327 of 1911. Memorandums concerning the proposed Scientific Department Scheme were circulated. The Meeting was unanimously against the proposed cess of 8 annas per acre.

Read letter from the Kanan Devan Hills Planters' Association regarding the building of a light Railway from Kodaikanal Road along the Cumbum Valley to Kuruvanooth. The Association intimated its willingness to co-operate with the Kanan Devan Hills Planters' Association.

District Roads.—Read letter No. 866 of 6/6/11 from the Division Officer Kottayam, intimating that Government would pay for no work done on the Cardamom Hill and Glenmary Roads unless agreements were signed. Read letter No. 794 of 29-6-11 from Chief Engineer supporting the same. Proposed by Mr. Bissett and seconded by Mr. Fraser : " That the Superintendents of Estates concerned in the maintenance of District Roads are individually prepared to enter into agreements with the P. W. D. from next Malabar year provided that the P. W. D. do not insist on agreements being made for the current year, which is practically finished, and would point out that when the roads were originally taken over no stipulations were made as to non-payment, failing an agreement being signed."—*This was carried unanimously.*

2nd Mile Cardamom Hill Bridge.—Read letters regarding this.

Proposed by Mr. Nicoll and seconded by Mr. Thomas : " That in reply to the Chief Secretary's letter No. 3259 of 30th June last, and in view of work on the bridge at the 2nd Mile of the Cardamom Hill Road being at a standstill, the Honorary Secretary be instructed to inform His Highness'

Government that not one stick of wood work for the platform is yet on the site, that all the rubble which may have been collected has been washed away and that there does not appear to be the slightest prospect of the bridge being fit for traffic before the end of the year. That the Honorary Secretary be also instructed to inquire what Government now propose to do in view of the complete failure of the contractor and to request that all future contracts pertaining to District Roads be as far as possible given to the planters whose interest it is to see that the work is carried out satisfactorily and expeditiously."

It was further proposed by Mr. Nicoll and seconded by Mr. Cantlay: "That owing to the Sircar Road being still unpassable for traffic, carts continue to use the Hope-Stragbrook private cart road, in consequence of which the road is in a very bad condition necessitating heavy expenditure, that Government be requested to defray the cost of repair and upkeep estimated at Rs.500 pending completion of the bridge, and that the Honorary Secretary be instructed to write accordingly."

Medical Scheme.—The Honorary Secretary intimated that there was nothing further to report.

Postal.—Proposed by Mr. Nicoll and seconded by Mr. Lacey: "That in view of the Madras mail being a day longer in reaching Peermade than formerly, the Honorary Secretary be instructed to write the Postmaster General and request him to revert to the previous arrangement."

Labour Rules.—Proposed by Mr. Bissett and seconded by Mr. Kinmond: "That the existing Rules be carried on until the next general meeting."

Election of Delegate to U. P. A. S. I.—Mr. Bissett was unanimously elected to represent the Association at Bangalore, U. P. A. S. I. Meeting, and Rs.150 was voted for his expenses.

The Meeting terminated with a vote of thanks to the Chair.

(Signed) W. H. G. LEAHY,
Chairman.

(„) J. S. WILKIE,
Hony. Secretary.

Shevaroy Planters' Association.

Proceedings of a Quarterly General Meeting of the Shevaroy Planters' Association held in Victoria Rooms, Yercaud, on 18th July, 1911.

PRESENT.—Messrs. S. Campbell, R. A. Gilby, A. B. Kundaswamy, J. C. Large, C. G. Lechler, W. I. Lechler, C. Rahm, L. E. T. Short, H. Gompertz (visitor) and Ch. Dickins (Honorary Secretary and Chairman).

(1). Notice calling the meeting was taken as read.

(2). *New Member.*—Revd. E. Spencer was elected a member of this Association.

(3). *Scientific Officer Scheme.*—Read circular from Secretary, U. P. A. S. I., dated 6th May and the late Chairman's memorandum concerning the proposed Scientific Department. Resolved: "That as the present meeting represents about a third of the members the Honorary Secretary be requested to take immediate steps to ascertain by reply postcards the

opinion of members who have hitherto failed to send in replies. On receipt of their communications, the Honorary Secretary would be in a position to let the U. P. A. S. I. know the feeling of this Association. The sense of the meeting was taken on the proposed scheme—6 voting for and 3 against it.

(4). *Coffee-stealing Prevention Act.*—Read letter dated 27th May from Secretary, U. P. A. S. I., and letter dated 10-6-11 from Collector and District Magistrate, Salem. Resolved: "That the Honorary Secretary do inform Secretary, U. P. A. S. I., and the Collector and District Magistrate that this Association does not consider any modifications are required—in Coffee-Stealing Prevention Act—with this additional information to the latter, *(viz.,)* that the rules have proved practically useful to us."

(5). *Hybridisation of Coffee.*—Read Government Order and Secretary's Circular No. 40/11 of 28th June. Resolved unanimously: "That this Association pay its share towards cost of up-keep of an experimental plantation on the Nilgiris for the Hybridisation of Coffee."

(6). *Delegate to Bangalore for the coming U. P. A. S. I. meeting.*—Resolved: "That the Honorary Secretary ascertain from Mr. B. Cayley whether he will represent this Association at Bangalore."

(7.) *Attestation of Cooly Agreements.*—Read and recorded letter dated 1st June from Collector and District Magistrate, Salem. Also Circular from Secretary, U. P. A. S. I., Nos. 21/11 of 29th March to 42/11 of 3rd July.

The following papers were on the table, (*viz.*) :—Agricultural Led. No. 3 Soy Bean in India, by D. Hooper. Price List of Howarth Erskine's rubber machinery, Report of Government Botanic Gardens, Parks on Nilgiris.

With a vote of thanks to the Chair the meeting terminated.

(Signed) CH. DICKINS,
Hon. Secretary, S. P. A.

Bababudin Planters' Association.

A Quarterly General Meeting of the Association was held at Santaveri on July 20th, 1911.

PRESENT.—Messrs. Denne (President), Hugonin, Johnson, Kerr, Morgan, O. Watson and Kirwan (Honorary Secretary). *Visitor*: Mr. F. W. Hight.

Messrs. Hugonin and Kirwan were deputed to meet the North Mysore and South Mysore Planters' Associations' representatives, if possible, and were authorised to come to any agreement or understanding in reference to the Assistant Scientific Officer Scheme and proposed Council of Mysore Planters' Associations.

The President or Vice-President and Honorary Secretary were elected as Delegates to the U. P. A. S. I. Meeting and received their instructions.

Resolved that this Association is opposed to Mr. Anstead's time being occupied in travelling, and would prefer him to specialise in a few subjects and only travel as he may consider necessary.

(Signed) NOEL G. B. KIRWAN,
Hon. Secretary.

RUBBER.

Acetic Acid Coagulation on Plantations.

The India-Rubber Journal publishes the following paper, which has been specially contributed by Mr. Watson Crossley, F. I. C.:—

Owing to the yearly increasing importance of plantation rubber as an industrial investment, a great deal of attention has recently been paid to every phase of the question of production, from the planting of the seed to the placing of the finished rubber in the hands of the consumer, and it is scarcely necessary to say that in bringing this industry to its present position, many mistakes have been made and much energy wasted. Mistakes are inevitable in the establishment of any new industry, but the wise man learns more from his mistakes than his successes, and it is a healthy sign that this appears to be recognised by the men at present so largely responsible for the future progress of the industry. It is becoming more and more evident that it is only by gaining exact knowledge of every branch of the rubber planting industry, and the application of such knowledge in practice, that the best finished rubber can be obtained, and, what is of importance to everybody concerned, at the lowest possible cost. From the point of view of the chemist no step in the production of marketable rubber is so interesting as that of the coagulation of the latex. The process is by no means a simple one if the best results are desired, and in spite of the good work done by Henri, Schidrowitz, Spence, Parkin, and other workers in this field, much more experimental data is necessary before the exact mechanism of the process is made clear. It is as a contribution to the data already published by other workers that the writer ventures to record some results obtained by him in the course of experiments in which acetic acid was employed as the coagulating agent.

Amount of Acetic Acid required.—A search through the literature of the subject shows an extraordinary variation in the amount of acid considered necessary to coagulate a given volume of latex, and it is difficult to bring the figures to a common basis. Thus Wright, in his "Hevea brasiliensis," 3rd edition, p. 174, states that "on Culloden Estate three drams of acetic acid are added to each gallon of latex, no matter in what condition the latter arrives at the factory; the acetic acid consists of three parts of water and one part of glacial acetic acid. On Gikiyanakande, one dram of acetic acid for each gallon of latex." On page 173 (*ibid*) Weber holds that half-an-ounce of glacial acetic acid per gallon of wild Pará latex gives a rapid and complete coagulation. Parkin (I. R. J., November 28th, 1910), states, as his experience with pure Ceylon latex, that one hundred volumes require one volume of glacial acetic acid. Obviously very large differences in the coagulating power of acetic acid are shown here, even after allowing for differences in latex, and, for the sake of comparison, the above figures for the acid have been calculated to a basis of unit volume of glacial acetic acid, and its coagulating effect, according to the data given, is shown below:—

Culloden Estate: One volume of acid coagulates 1,706 volumes of latex. Gikiyanakande Estate: one volume of acid coagulates 1,280 volumes of latex. Weber: one volume of acid coagulates 320 volumes of latex. Parkin: one volume of acid coagulates 100 volumes of latex.

It is unfortunate that more definite information regarding the exact state of dilution and acidity of the untreated latex is not given by either Weber or by those in charge of the two estates quoted, so that a more accurate comparison could be made with the definite amount named by Parkin. In this connection it may be of interest to give the results of some

experiments recently made by the writer with Hevea latex, kindly supplied by the Langkat Sumatra Rubber Co., Ltd. Unfortunately the latex had been considerably diluted before leaving Sumatra, and no information was available regarding the exact amount of water added. Apart from the dilution the latex was a normal one :—

Specific Gravity at 15 deg. C.=0·997.
Rubber =7·0 per cent.
Proteid (N x 6·25) =0·49 per cent.

Comparing these results with published analysis of undiluted latex, the proportions of added water and pure latex are probably 3-4 of the former to 1 of the latter. The latex was slightly acid to litmus paper, and 10cc. required 1·5cc. of the deci-normal caustic soda for neutralisation, using phenolphthalein as indicator. A small amount of formalin had been added, and the latex arrived in London in good condition. To find the maximum amount of acid required, 10cc. of latex were transferred to each of a series of five test tubes, a standard solution of acetic acid (1cc.=0·0543 grams of acetic acid) added in amounts of 0·1cc., 0.2cc., 0·3cc., 0·4cc., and 0·5cc. and after a slight shaking to ensure thorough mixing of the latex and acid, the test tubes allowed to stand for half-an-hour. At the end of that time, with the exception of No. 1, the contents of the several test tubes showed a separation into a clear serum and a floating clot of rubber. The minimum amount necessary to coagulate 10cc. of latex, clearly lay between 0·1cc. and 0·2cc. of the acid employed, and a further series of tests were made with acid to such a strength that 1cc. = 0·0053 grams acetic acid and the exact amount found to be 1·6cc., or 1·6 x 0·0033 = 0·6085 grams acetic acid per 10 cc. latex. Ignoring the coagulating effect of the "natural acid" present, 1 part by weight of acetic acid coagulates 10·0985 = 1,176 parts by volume of latex.

It is at this point that one sees the probable explanation of the varying amounts of acetic acid qnoted as necessary by the authorities mentioned earlier in this article; for, assuming that the latices coagulated on the Culloden and Gikiyanakande estates are largely diluted before addition of acid, and that the time elapsing between the collection and coagulation of the latex allows of the formation of fermentation acids, two important factors affecting the amount of actual acetic acid to be afterwards added come into play, so that the quantity of acetic acid required to coagulate a given volume of latex is apparently much less than is really the case.

Minimum Quantity of Acid.—Parkin in discussing the question of the minimum amount of acid necessary to produce coagulation (I. R. J. November 28th. 1910), points out that "The percentage of acid necessary is proportional only to the original volume of latex present, and is independent of its dilution with water." The following experiments carried out by the writer confirm this statement.

The method employed consisted in preparing solutions of latex of known strengths, and ascertaining the amount of acid necessary to produce coagulation. Thus, to find the acid required to coagulate a 50 per cent. latex solution, 10cc. of latex were transfered to each of the three test tubes, water added in the proportion of 8·75cc., to 8·50cc., and 8·25cc., and acid (1cc.=0·0053 grams acetic) 1·25cc., 1·5cc., and 1·75cc. After a slight shaking, the test tubes were allowed to stand for half-an-hour, and the appearance of the contents noted. The serum in test tubes (1) and (2) was turbid, but in (3) it was clear. The experiment was repeated with quantities of acid equal to 1·6cc. 1·65cc., and 1·7cc.: serum in (1) and (2) very slightly turbid, but in (3) clear.

Then the acid added 1·7 x ·0058=0·009 grams, or 0·009 x 5=0·045 grams per 100cc., and "natural" acid present=0·009 grams, or 0·009 x 5=0·045 grams per 100cc. Total acid=0·090 grams per 100cc.

The results of this experimental series are given below, and are also shown plotted in figure 1.

Percentage of latex.	Natural acid in grams per 100cc, calculated as acetic acid.	Acetic acid added in grams per 100cc.	Total acid in grams per 100cc.
86·2	0·0766	0·0733	0·151
75·0	0·0675	0·0636	0·131
50·0	0·0450	0·0450	0·090
25·0	0·0225	0·0230	0·045
10·0	0·0090	0·0106	0·019
5·0	0·0045	0·0053	0·0099
1·0	0·0009	0·0032	0·0041

Parkin's statement is thus shown to hold good over a surprisingly long range of value, and it is also of interest to note that if it be assumed that the latex used has already been diluted 3 to 4 times, and values extrapolated on the straight line ploted, the figure obtained for the acid necessary to coagulate 100cc. of pure latex would be 0·7 of pure glacial acetic acid, thus closely approaching the value found by Parkin. Another assumption made is that the coagulating powers of the "natural" acid are equal—a point which can only be determined by future experiments.

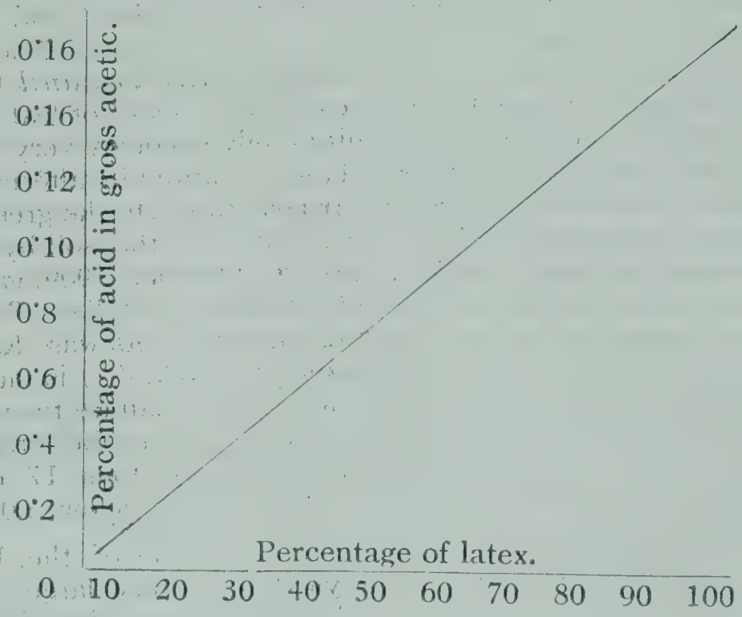

Fig. 1.

(To be continued.)

Under section 4 of the Madras Planters' Labour Act, 1903, the Governor of Madras in Council has authorised Mr. Joseph Charles, of Sentinel Rock Estate, Wynaad, to witness the execution of labour contracts.

SOILS AND FERTILISERS.

Green Manures.

The latest Royal Botanic Gardens circular deals with green manures, and is by Messrs. M. Kelway Bamber and J. A. Holmes. They point out that within the last few years the value of nitrogen-producing plants has been recognised in Ceylon, but the difficulty of keeping them in check, when labour is required for other purposes, has to a great extent prevented their general adoption. The advantages accruing from green manures are then enumerated and a list of the plants, shrubs, and trees which have been experimented with at Peradeniya is given. Of crotalarias, the first mentioned is *crotalaria striata* (Andanahiriya, S.,) which is very common from sea-level to 4,000 feet, and thrives better in those parts of the island which depend chiefly on the north-east monsoon for their rainfall. It also prefers a fairly free soil, and does not grow well in heavy clays. To ensure success it must be shown at the commencement of either of the rainy seasons, varying with the district. It yields heavily, and when grown alone has given 14¼ tons of stalk and leaf and 5¾ tons of root residue per acre in one cutting. If cut before flowering, and not too low, it shoots again readily in growing weather, and will give up to four cuttings before dying out. Planted in an acre of Tea in alternate lines, the total yield obtained in three cuttings for mulching purposes was 20,827 lbs., at a cost of Rs.9'25 including seed.

Crotalaria incana is the next best for green manuring purposes, the growth being low and very leafy. It, however, does not always stand cutting well, and soon dies out. It has given as much as 8 tons and 15 cwt, per acre at the first cutting, and 2 tons 4 cwts. at the second. The next kind of plants mentioned is indigoferas, and of these *indigofera anil* (Awari, S.,) has a good spreading growth, and produces a fair amount of leaf. It stands cutting well three or four times, but ultimately becomes very woody, and the stems and roots are difficult to eradicate. Planted in alternate lines in poor tea it has proved very successful, partly through the green material produced, and partly through the disintegration of the soil by its roots. One plot planted with this green manure in October, 1909, gave a total yield of 9,340 lbs., including 602 lbs. of roots and stalks. The cost of cutting and mulching 4 times and pulling out the roots was Rs.13-20 per acre. Of tephrosias, *tephrosia Hookeriana* (Ratapila, S.,) is mentioned as one grown to a very large extent in Java as a green manure for rubber. It must not be allowed to get too woody, or it is liable to be attacked with "Pink Disease." It gave two cuttings during 1910, 7 tons 17 cwt. and 4 tons 16'4 cwt. per acre. It is best suited for elevations below 3,000 feet.

Tephrosia candida has proved at Peradeniya one of the best green manure plants, being very hardy, and yielding a very large amount of material. Its habit is to form a large bush to a height of eight feet or more, and if kept cut, even when the wood is mature, it forms a dense leafy cover, effectively checking the growth of weeds and preventing wash. For rubber it can be planted with seed at stake three to four feet apart each way, so that weeding can be continued till the crop covers the ground. Planted 1 foot apart in rows and cut when four feet high four times in the year before flowering it yielded altogether 58'92 tons per acre. The nitrogen content in the air dried leafy branches is 2'80 per cent., or 2 per cent., on the fresh plant. This represents approximately 2,639 lbs. of nitrogen, partly derived from the air and partly from the soil, an amount contained in 16'83 tons of ground-nut cake. Presuming that only 30 per cent. of the nitrogen was obtained from the air through the root nodules, the increased manurial

value would be Rs.555 per acre. Of miscellaneous plants, *cajanus indicus* (Bolakadala, S.,) pigeon pea or dhall, yields about 9,200 lbs. per acre, containing about 42 lbs, of nitrogen, value Rs.21, and *glycine soja*, better known as the soy bean, proved unsuccessful at Peradeniya.

Of tree forms of green manures, the chief are *erythrina lithosperma*, "Dadap," *Albizzia moluccana*, *Gliricidia macülte*, and *acacia decurrens*. The first grows best at about 1,600 feet, but also grows satisfactorily in free soils in several districts up to 4,000 feet. Below 1,000 feet the *albizzia* is more suitable. For tea the trees are cut across at 4 to 5 feet and kept lopped as often as necessary, usually two to four times a year. The leafy branches are then mulched between the rows of tea or buried, according to the labour available. The tea bushes, in areas so treated, have a healthy dark green appearance, and on an acre plot planted 16 feet by 16 feet, with no manure, except a mixture of 200 lbs. of basic slag and 60 lbs. of sulphate of potash at the last pruning in October, 1909, the yields have been 767 lbs., 680 lbs., 1,226 lbs., and 1,445 lbs., from 2,132 bushes. *Albizzia moluccana* has much the same effect. *Acacia decurrens* is for elevations above 4,000 feet, at which Albizzia and Dadaps are not very successful. It is an excellent green manure and wind belt for tea. As a wind belt for old and young tea it is best planted about 16 to 20 feet apart in rows, with the trees three to four feet apart. These are kept cut at three to four feet some time before the monsoon, so that a good thick growth may be made, sufficient to lift the wind over the intervening rows of bushes. Several other non-leguminous plants have also been experimented with, including *mikania scandens* and *passiflora foetida*, the two latter having been largely used for preventing wash and killing out "illuk" or "lalang." From the general results obtained in the saving of wash, improvement of soil, by the increased humus and retentiveness for moisture, there is little doubt that green manuring has now been established in Ceylon as the best and most practicable method of permanently improving the soil. For tea it is particularly beneficial, and for rubber the preservation and increase of humus in Ceylon soils is of the utmost importance, not only for the growth of the tree, but for the future flow of latex and healthy renewal of the bark. —*Tropical Agriculturist.*

Weed Destruction in the Philippines.

From an article in the *Philippine Agricultural Review* for February 1911, it appears that the plant *Lantana camara*, which is one of those known as 'wild sage' in the West Indies, has been introduced together with other tropical American weeds and ornamental plants, into the island of Negros, in the Philippines. This plant, by its rapid spread and luxuriant growth, has already caused trouble to agriculturists in Hawaii, where insect pests have been introduced for the purpose of diminishing its spread.

The measures that are proposed for the eradication of the weed before it becomes disseminated beyond control consists in the process of loosening the root system, which is very weak, by means of a pick or a strong wooden stake and then cutting through the roots just below the collar; the plants treated in this way are allowed to become dry in the sun, and are then burned as soon as they are fit for this to be done.

The most potent circumstance in the spread of the plant is the fact that the fruits are eagerly eaten by the birds, which do not however digest the seeds.

As is well known, the plant is a perennial and attains in the West Indies a height of 5 to 7 feet. In Hawaii, it has been known to grow as tall as 15 feet, but the specimens in Negros were only 6 to 9 feet high, at the time of publication.

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(INCORPORATED.)

The Chairmanship.

The Hon'ble Mr. J. G. Hamilton has assumed charge of the duties of Chairman of the Association.

The International Rubber Exhibition.

Mr. J. A. Richardson's official report has not yet arrived. He writes:—"I have attended the Exhibition daily since it opened and hope shortly to send you some useful information regarding Rubber machinery, &c., but this will all follow with my report."

"The Exhibition has been a great success and I am sure has done a lot of good."

The following remarks are quoted from a letter from Mr. H. P. Hodgson:—

"My impression of the Exhibition was that it was excellently done and arranged, and was full of interest not only to rubber growers, but also to that very large section of the public who are now interested as investors in Rubber Companies.

"The South India stall is a very good one in about the best position in the Hall, and the best has been done to make it attractive considering the poorness in number and quality of the exihibits. With one or two exceptions no trouble seems to have been taken by South India growers to send samples of their rubber, and it was very disappointing to have to realise that once again we have made little use of a fine opportunity of advertising South India as a Rubber growing country.

"Walking round the stalls representing every rubber growing country, and almost district, of the world the contrast was very great, for in them were to be seen piles of cured rubber of all grades and kinds, and all sorts of exhibits connected with its production. These were inspected by *investors* with perhaps even greater interest than by planters or manufacturers, and therein lies the pity of it, for to them it must have appeared that South India, as a rubber producing centre, is behind the rest of the world."

Special interest attaches to the following further extract from Mr. Hodgson's letters:—

"One thing an American manufacturer, whom I had a long talk with, laid particular stress upon was that in plantation rubber small splinters of wood are sometimes found and these are very difficult to get rid of even by breaking up the rubber and re-washing, the presence of these splinters would

have an effect on the price at once. He said he *thought* they might come from the cases in which the rubber is packed, it might also be in harvesting, but the latter is improbable, as the latex is carefully strained, but it may be worth while for planters to make a note of it."

Mr. Richardson advises despatch of a number of hand-books, official guides, &c., &c., but the only papers that have arrived yet are some copies of the *Daily Graphic*, containing an article on Rubber in Southern India, and a few copies of the U. P. A. S. I. hand-book. Copies of these have been sent to District Planters' Associations; a few more are still at the disposal of applicants—the *Graphic* free, the hand-book at Re.1 per copy, V. P. P. The latter is a very neat little publication and contains interesting illustrations.

Castilloa Rubber.

A correspondent in issue of 24th June asked for information about results obtained with Castilloa Rubber. His attention is now called to an article reproduced in this issue from the Proceedings of the Agricultural Society of Trinidad and Tobago describing the cultivation of Castilloa and the results obtained from it in the latter island. The species of Castilloa cultivated in the West Indies is, however, different to the one usually seen on estates in Southern India, which appears in most cases to be an unproductive one. Mr. Wicherley, in the chapter on *Castilloa elastica* in his book on 'The Whole Art of Rubber Growing,' which has lately come to hand, says:—

"The Castilloa or Castilla rubber tree is indigenous to Central America, where it is highly prized as a caoutchouc producer, and as a hardy drought-resisting tree that flourishes alike on the plain or at an elevation of 3,000 feet above sea level. It derives its name from Castillo, the Spanish botanist who was killed in the forest in 1793 whilst engaged on the Flora of Mexico for the Government. The Castilloa sports a great variety of species. During a recent visit to Ceylon I saw several plantations that were labelled Castilloa, but which I recognised as being merely the old Darien Castilloa, the despised Caucho tree of the Isthmus of Panama. I was, therefore, not at all surprised to learn that the Castilloa in Ceylon was not a success, that it was difficult to tap, and that the yield was both small and very uncertain. As a matter of fact the Darien Castilloa was up to quite recently always cut down when it arrived at the tappable age, in order to obtain from it anything like an adequate yield of latex, and for this reason it never entered into favour with cultivators who desired to plant rubber as an investment in tropical agriculture.

"It is difficult to explain how Ceylon became possessed of such a disappointing tree. The original stock, which was introduced into Kew by Cross in 1875 for the Indian Government, was obtained from the neighbourhood of Gatun, where it grows like a weed. It is curious that no plants subsequently distributed from Kew to various places in the tropical colonies are identical with those familiar to Central America, nor do they possess characteristics of the true Castilloa elastica, which Cross might have been in all its native beauty and glory a few hundred miles away in Nicaragua or in British Honduras.

"Castilloa elastica is one of the *Artocarpaceae* (natural order *Urticaceae*) to which the jack tree and bread-fruit tree belong. It is a taprooted plant, like the Hevea brasiliensis. It delights in partial shade for the first few years of its life, and revels in a deep, moist cloggy loam, although at the same time it is quite at home in any other soil where it can grow fast and uninterrupted by violent changes in the atmosphere."

Scientific Officer's Papers.

LXXIII.—'SCIENCE AND AGRICULTURE.' MISCELLANEOUS ITEMS.

A number of Scientific publications dealing with agriculture in all its various branches are received at the U. P. A. Office, as well as a large number of Reports from Agricultural Stations in India and other countries. The articles in these which are thought to be of the most interest to the planters in Southern India are reproduced in the *Planters' Chronicle*, but there is often a good deal of matter which is of interest which does not lend itself to such reproduction. It has been suggested to me by a correspondent, who takes a lively and practical interest in U. P. A. affairs, that it would be useful if I would, from time to time, collect these items together, with notes on the more technical papers in the Scientific Journals, and embody them in a 'chatty' form into a 'Scientific Officer's Paper.' This paper is an attempt to comply with my correspondent's suggestion, and I would that more planters would send me similar suggestions. The Secretary and I are always glad to receive suggestions from planters as to how to make the *Planters' Chronicle* more interesting and efficient, yet it is very seldom that any comments at all are made. Even adverse criticism is preferable to absolute silence on the subject.

The most important and interesting occurrence in the realm of Agriculture during the past few weeks has been the International Rubber Exhibition, which was opened on 26th June, by the Earl of Selbourne.

Grenier's Rubber News published a cabled account of the opening, but no mention was made of the South Indian Exhibits, and the Bangalore *Daily Post*, when reviewing the official handbook of the Exhibition, criticises us in a way which I fear is deserved.

"From the sectional arrangement there are points worth noticing, especially to the Indian planter, and that is that although Ceylon has been able to contribute fifty pages of most interesting matter, and the Straits have given as much, India is as usual in these matters practically *purdah*, and but for a readable article on the industry in the South, a portrait of the Chairman, and a few advertisements, would have been left out altogether. That this is not as it should be is evidenced by three salient remarks in the book; one says, 'Turn where you will in the rubber-producing areas of South India, and the outlook is bright, the position is a sound one, and there is every indication that steady progress will be made for years to come.' This article is obviously written by an expert, and is a masterly glimpse of the whole South Indian position, and we cannot understand why the Indian planter and the Indian Government do not show the world more of India's possibilities in this direction. Six exhibits, mainly from the Shevaroys, Travancore, and Mysore, and a collection of photographs is all there is to show for the work of a committee consisting of nineteen men, all well known in the planting circles of South India. This coyness of India is a fatal mistake. She can no longer afford to coquette with outside capital, and if it be through fear of competition that she is reserved in this manner, it is a fallacy, whose result is written across the miserable condition of her poverty-stricken agriculturists. There is room for all, for many a decade, in a land of cheap labour, and uninhabited acreage, and the attitude in regard to rubber assumed by the forest officials in South India is a matter that requires sifting. The précis on the position closes with the words, 'South India does not hesitate to invite attention to the quality of its exhibits, while it cherishes the belief that the future will prove that present expectations are justified by bringing it into the front rank of economical and successful producers of plantation rubber.'"

Agriculture, which is such an important asset to the British Colonies, found a place in the discussion in connection with the Imperial Conference, and *Nature* reports that :—

"A meeting was held at the Colonial Office on June 14 to discuss with representatives of the self-governing Dominions and States a scheme for imperial co-ordination in the prevention of the spread of disease in agriculture and horticulture, which it is proposed to organise in connection with the Colonial Entomological Research Committee. An official report states that Lord Cromer, Chairman of the Entomological Research Committee, explained the proposals, the object of which is to establish a central organisation in London for the transmission of information to the various parts of the Empire, thus enabling them to legislate against the introduction of certain insect pests with a greater knowledge of the facts than would otherwise be possible. After a discussion, in the course of which the representatives expressed their hearty approval of the scheme, the following resolution, proposed by the Premier of New South Wales and seconded by the Premier of Tasmania, was passed unanimously :—

'That this meeting is of opinion that the proposal to obtain and disseminate information of a scientific and useful nature, tending to prevent the spread by insects of diseases both in animals and plants to various Dominions and States of the Empire would be highly advantageous, and that steps should be taken to obtain the adhesion of the Dominions and States interested in the matter.'

Biochemistry, by which is briefly meant the study of the living cell, has of late years received a great deal of attention. There exists a Biochemical Club consisting of chemists, botanists, and physiologists, who are studying this difficult subject, and during June they held a meeting at Rothamsted, the famous English Agricultural Experiment Station. A number of highly technical papers were read, among which was one by Dr. Russel, who is continuing his studies on the sterilisation of soil. Articles dealing with this subject were reproduced in the *Planters' Chronicle*, Vol. V, pp. 122 and 147. The results obtained in the laboratory are rapidly being translated to the field and becoming of practical value to the planter. It is a matter of common experience, for instance, among horticulturalists that soil in which Tomatos and Cucumbers have been grown a few times becomes 'sick,' and will not grow these crops again in a satisfactory way. Dr. Russell finds that heating the soil to anything between 130° F and 212° F, or treating it with toluol, much enhances the productiveness of such 'sick' soils. When the soil has been heated at the lower temperature the germination of the seed is hastened, but when the higher temperature is used retardation of germination often results.

"The young plant not infrequently shows a retardation, but it may also show an acceleration of growth ; indeed acceleration and retardation appear to go very closely together, and, in what appear to be uniform conditions, one set of plants may be accelerated and another retarded. At this stage it seems as if there is some substance present which in small quantities helps the plant, and in larger quantities injures it. Later on, the plants in the partially-sterilised soils make better growth than the others, because they have more food ; if the soil has been heated to 212° F., the plants become very compact and short-jointed."

Sterilization of the soil in seed beds is made extensive use of by Tobacco growers in the United States, and the *Farmer's Bulletin* No. 451, gives an account of the practice, which it is stated has been abundantly tested, and proved to be practicable and profitable.

"Beds which have been properly sterilized by steam will need no weeding, as only an occasional weed will show itself before the seedling tobacco plants are pulled. The saving of labour alone pays the cost of sterilizing when the apparatus for it is at hand. The root rot will also be killed and the tobacco thus saved from its attacks. . . . .

"It is a matter of common observation, both in greenhouses and in tobacco beds, that the plants in sterilized soil start quicker and grow faster than in untreated soil. This may be in part explained by the warming of the soil, partly by a possible solvent action of the steam or heated moisture on the plant food in the soil, but is no doubt in large part due to a change in the microbe life of the soil effected by the treatment, which may utterly destroy certain kinds of microbes, repress others, and yet leave conditions favourable for the rapid growth later of those species which make available the nitrogen of the soil, or otherwise favour the growth of the tobacco plant.

"The root rot and some other fungus troubles appear to be completely destroyed by steam sterilization and largely by the formalin treatment."

Steam is generally used for the purpose, under a pressure of 75 to 100 pounds supplied by a portable 6 to 8 horse-power boiler. When this is not available, Formalin is used, the following method being adopted :—

"A solution of 1 part of formalin—40 per cent strength—in 100 parts of water ; that is, a pint of good commercial formaldehyde, also called 'formalin' in 12½ gallons of water, was gradually sprinkled over the bed at the rate of 1 gallon per square foot, taking care not to puddle the soil. The bed was then covered with burlap or sash to hold in the fumes."

Our Nilgiri friend, the Green Bug (*Lecanium viride*) is reported by Mr. Green, in the Journal of *Economic Biology*, to have turned its attention in Ceylon to Hevea Rubber. Luckily it occurred only on young trees and was thus amenable to treatment by spraying. In the same publication appears an article by Mr. Lefroy, the Imperial Entomologist, who is at present in England enjoying a well earned holiday, in which he "offers advice on the training of British entomologists, with special reference to students prepared to take service in British Colonies, or possessions. He insists particularly on the desirability of infusing a more 'economic' character into the student's training.' (*Nature*). Planters in India and the Colonies are rapidly realising that such trained men are necessary to look after the welfare of their crops, but, as the *Agricultural News* says, "although very rapid progress has been made in recent years, both in the actual knowledge of plant diseases, and in the recognition by the world at large, and by Governments in particular, of the importance of this, yet much more work must be done, and many more men must be employed, before the full advantage of the scientific knowledge which is even now available can be obtained by agricultural communities."

Private individuals are more and more contributing to the good cause, and I note that quite recently Mr. Robert Christison has contributed the sum of a thousand pounds for the second time to the University of Brisbane for the foundation of a chair for tropical and sub-tropical agriculture.

RUDOLPH D. ANSTEAD,

Planting Expert.

Notes and Comments by the Scientific Officer.

122. *Wing Scales of Butterflies and Moths.*—The exquisite way in which details are worked out in Nature, and the beautiful way in which mechanical difficulties are overcome, supply one with material for wonder and admiration. Any one who has ever examined the wing of a moth, or butterfly, under a magnifying glass knows that it is covered with scales which overlap at the edges like the tiles on a roof. These scales are beautifully marked and vary in shape, size, and pattern, in different species. Now, when a butterfly, or moth, first emerges from the chrysalis its wings are shorter than its body, but they rapidly expand until in a few hours they are fully extended and of the normal size. How about the scales in this case; do they also grow rapidly, and if not how is it that they can completely cover an area which rapidly increases in size? The answer to this question bears out what I said at the beginning, and is a typical instance of one of Nature's wonderful ways of arranging these matters. Mr. R. T. Lewis, F. R. M. S., who has investigated the question in a specimen extracted from a pupa, writes in the June number of 'Knowledge' as follows:—

"It had often been a matter of conjecture how it was that when the wings of a butterfly were fully expanded a few hours after emergence, the scales were all perfectly formed and covered the entire wing surface by overlapping at their lower edges like tiles when laid on the roof of a house. It did not seem possible that if the scales were fully formed and covered the wings in the same manner when only one third of their ultimate length, they could also cover the expanded wing so completely as we find to be the case in the mature insect. On setting the specimen refered to, and placing it under the microscope, the mystery was at once solved by finding that the scales were all there and in perfect condition, but instead of lying flat they were standing on end attached to the membrane of the wing in the usual manner, but so close together that the coloured pattern formed by them could be distinctly made out. In this position,—just as roofing tiles take up less room when standing close together on edge,—the scales then occupied a minimum amount of space, and it seemed clear that as the membrane expanded it would draw their stalks farther apart, and at the same time cause them to lie down, and in this way cover a greatly increased area."

123. *Ratio of Lime to Magnesia in the Soil.*—Recent experiments in America and Japan lead to the conclusion that plants generally grow better in a soil in which the ratio of Lime to Magnesia is high, that is when there is an abundance of calcium compounds to neutralise the harmful effects of the Magnesia. In America "examinations of a number of soils on which sick and healthy trees were growing showed that when the percentage of Lime in the soil was less than about twice that of the Magnesia there was derangement of nutrition in orange trees," and it is believed that, "many cases of malnutrition, particularly incipient chlorosis, or mottled leaf, in orange and lemon trees can be traced to an excessive proportion of Magnesia to Lime in the soil.' In my office I have a record of 35 analyses fairly representative of the soils of Southern India on which Coffee, Tea, and Rubber are cultivated, and I find that only 5 of these show a ratio of Lime to Magnesia of 2 : 1 or more. The ratio in the majority of cases is about 1 : 1 while in several soils it is nearer 1 : 2. It is significant that in the case of a soil which was reported as 'bad,' the ratio is 1 : 7. This points to the fact, which has often been insisted upon in the pages of the *Planters' Chronicle*, that Lime and alkaline fertilisers ought to be more generally used than is at present the case.

RUDOLPH D. ANSTEAD,
Planting Expert.

DISTRICT PLANTERS' ASSOCIATIONS.

Nilgiri Planters' Association.

ANNUAL GENERAL MEETING.

The Annual General Meeting of the Nilgiri Planters' Association was held at the Armoury on May 29, 1911. Mr. Rhodes James was voted to the chair. The other members present were:—Mr. L. L. Porter, Honorary Secretary; Messrs W. A. Cherry, W. Deane, W. Rowson, A. S. Dandison, J. McKenzie, A. K. W. Downing, N. J. Stanes, P. Beaver, and George Oakes.

THE LATE MR. R. D. TIPPING.

The following resolution was proposed by Mr. Deane and carried unanimously:—

"The first item on the agenda appeals feelingly to us all. We are unanimous in the expression of our sorrow at the sudden death of our esteemed Chairman, the late Mr. R. D. Tipping. His own Association will doubtless claim the privilege of carrying out a suitable memorial, but if anything is being done in a general way to perpetuate his memory, we hope to be allowed to join in. In the meantime I move that this meeting records his lamented death to our united grief and that the expression of our heartfelt sympathy be made known to his widow and to his brother, Mr. Percy Tipping."

ANNUAL REPORT.

The following annual report was read by the Honorary Secretary:—

I have to submit the annual report and accounts for the year ending 31st December last. I took over the Honorary Secretaryship from Mr. Barber on the 2nd October. The balance brought forward from 1909 was Rs.418-1-0. Annual subscriptions amounted to Rs-931-1-0. Rs.1,755 were received on account of the Sc. O. Fund, Rs.255 for Laboratory Fund; Rs.55 for P. B. Fund, and Rs.22-2-0 incidental receipts.

Office and Bangalore delegates' expenses amounted to Rs.545-11-4. Rs.125 and Rs.150 outstanding subscription for 1909-10, were paid to the U.P.A.S.I. and Sc. O. Fund, respectively. Rs.625 on account of 1910 subscription to the U.P.A.S.I. and Rs.1,250 Subscription to the Sc. O. Fund for 1910; Rs.40 to the P. B. Fund. Balance at Bank and Cash in hand amounted to Rs.700-1-8.

Rs.75 was due by members to the Laboratory Fund, Rs.210 to annual subscription, and Rs.260 to the Sc. O. Fund; considerable portions have since been paid.

One member owing 2 years' subscription, on receiving an urgent reminder, asked that his name be removed from the list of members. I replied that as he had received 2 years' benefit from the Association, including the *Planters' Chronicle*, his name would not be removed until arrears were paid up. It would be useful if a definite line of action was laid down to meet a case such as this.

Since 1st January, Rs.470 has been received on account of annual subscription, Rs.560 Sc. O. Fund, Rs.35 Lab. Fund, and Rs.25 P. B. Fund. Balance at bank on date, including Rs.320-6-2 handed over to me by Mr. Barber, amounts to Rs.1,577-7-9 and the cash to Rs.54-1-3.

Four members have resigned the Association, representing acres 1,228, and 4 members have joined, representing acres about 760. The total number of members on 1st January 1911 was 65, representing an acreage of 16,427 acres.

So far as can be ascertained, the acreages of estates are now fairly correct. Members are sometimes, I think, uncertain whether they should pay on "cultivated acres" or "acres in bearing." It should be remembered when sending in returns that subscriptions are payable on "cultivated" acres.

It is disappointing that meetings are so poorly attended and that few members bring up questions for discussion. One would think that there are many evils from which we suffer that could be remedied or improved upon if we were all to pull more together and many things that we want done, could be done, if we went "solid" for them. But unless we occasionally meet together as a district, I don't quite see how we can expect things in general to be bettered.

The resignation of the committee and myself are now placed in your hands.

Mr. Rhodes James proposed and Mr. Cherry seconded: that the report be adopted, which was unanimously carried.

With reference to the Honorary Secretary's remarks as to non-payment of Subscriptions the following resolution, proposed by Mr. Dandison and seconded by Mr. Deane, was carried unanimously: "That the *Planters' Chronicle* be stopped and no vote allowed to any defaulting member until all arrears are paid. And that three months' grace be allowed from the date on which the subscription is due.

Office-Bearers.

The following committee was elected:—

Messrs. A. S. Crum, W. Deane, J. McKenzie, J. Harding Pascoe, W. A. Cherry, R. S. Campbell-Gompertz, A. E. Dandison, E. F. Barber, A. K. W. Downing, W. Rhodes James, J. H. Wapshare, and J. S. Nichols. Proposed by Mr. Deane and seconded by Mr. Cherry.

"That Mr. L. L. Porter having consented to continue to act as Honorary Secretary till January 1912, Mr. Downing be asked to take up the duties from that date and that Mr. Downing with Mr. Barber be asked to attend the U. P. A. S. I. meeting in August next, should the Honorary Secretary, Mr. Porter, be unable to attend this year.

The Eight Anna Assessment.

The following proposal by Mr. Porter, seconded by Mr. Rhodes James, was carried unanimously:—"That the question of confirming the eight anna subscription be postponed till after the U. P. A. S. I. meeting in August next, to enable Members to obtain any further information that may be given at that meeting."

Nor-Service of Warrants.

In this connection the following resolution was proposed by Mr. Dandison, seconded by Mr. Beaver, and carried unanimously:—"That as the number of coolies absconding to Travancore and Cochin has now reached very considerable proportions, Government be asked to use their influence with the Governments of Travancore and Cochin with a view to their granting the same mutual facilities for extradition of coolies under Labour Act I of 1903 as are now given by the Mysore Government."

The Labour Act.

The Collector's report on the working of the Labour Act I of 1903 was recorded.

Out-Agencies and Railway Rates.

With reference to correspondence between the Honorary Secretary and the South Indian Railway authorities, the following resolution, proposed by

Mr. A. S. Dandison and seconded by Mr. A. K. W. Downing, was unanimously carried:—

"That with a view to establishing Railway out-agencies for the collection and delivery of produce, manure, etc., and obtaining a reduction on Railway rates, those members who have not replied to the Honorary Secretary's circular calling for figures regarding produce and manures should do so without delay, as the matter is of the utmost importance. Any benefits gained would apply to goods consigned from any one station to any other on the whole of the South Indian system and also to and from stations on the Nilgiri Railway."

DESTRUCTION BY SAMBHUR.

With reference to the destruction of rubber and shade trees by Sambhur, several members spoke and gave instances as to the extent of damage done to European and native cultivation by the over-protection of Sambhur. Mr. Oakes explained that in former years when coffee was grown in the open and before the cultivation of Rubber the damage done by Sambhur was not serious, but that since the adoption of shade for coffee and tea, and the planting of Rubber, their depredations were a very serious matter, so much so that in many instances his trees had been so badly barked that he had to cover the stems with moss, &c., to help the renewal of bark.

He did not for a moment wish to interfere with the Game Association, but would suggest a relaxation of the Game Laws where cultivation adjoined Government reserves. He pointed out that Sambhur took shelter in these reserves by day, and during the night destroyed cultivation, and gave instances where crops of raggi and samay, cultivated by ryots, were completely destroyed. He would ask that Badagas who possessed cultivations of 25 acres and over should be given guns that would kill in the place of guns with shortened barrels. He would also strongly advocate that reserves in the vicinity of cultivation should be thrown open to beating.

Instances of serious damage to Rubber were given by Mr. Dandison and Mr. Downing and it was pointed out that one Estate had been obliged to erect 7 miles of wire at considerable cost and that other Planters intended wiring in their Estates.

If this became general the Sambhur would be driven more into native cultivation, thereby increasing the damage done to crops. It was also argued that if beating, &c., were allowed as suggested by Mr. Oakes it would not necessarily follow that Game would be killed out but that it would clear off to less inhabited districts. It was finally proposed by Mr. George Oakes and seconded by Mr. Dandison, and carried unanimously: "That with the view of protecting the cultivation both on the European Estates and the surrounding Badaga cultivation, it is proposed that the Collector of the District be approached on the subject of the game laws and that the same may be relaxed in the cultivated areas. It is suggested that where there are reserved blocks of sholas in the neighbourhood of estates or villages these be thrown open to beating and that the Badagas owning say 22 acres of land, may be allowed a gun that will kill."

PURCHASE OF CINCHONA BARK.

With reference to a letter from Mr. Rowson stating that he offered his cinchona bark to the Director of Cinchona Plantations early this month, and the latter replied that he had already made arrangements for the purchase of bark for the year—after several members had spoken on the subject, it was proposed by Mr. Rowson and seconded by Mr. McKenzie, and carried unanimously; "That the Director of Government Cinchona plantations be requested to advertise in the District Gazette for the quantity of bark required each year in such time as to enable local planters to submit tenders."

SCIENTIFIC OFFICER'S TOUR.

Reference was made to a complaint by a subscriber to the Sc. O. Fund (not a member of the N. P. A.) that the Sc. O. had not visited his estate when on tour, and to a circular from the U. P. A. S. I. on the subject. The Honorary Secretary pointed out that the Association would in no way assist such cases when arranging the Sc. O.'s tour in the District and that gentleman subscribing to the Sc. O. Fund but not members of the N. P. A. must make their own arrangements.

VOTE OF THANKS.

The meeting terminated with a vote of thanks thanks to the Chair and to the O. C. the Nilgiri Volunteer Rifles for the use of the Armoury.

(Signed) L. L. PORTER, *Hon. Secy., N. P. A.*

South Mysore Planters' Association.

Extracts from Minutes of a Meeting held at Hanbalu on 27th July, 1911, at 10 a.m.

PRESENT :—Messrs. E. M. Playfair (President), A. R. Park, K. Thummaya, W. L. Crawford, C. Lake, M. I. Woodbridge, P. Hunt, The Hon'ble Mr. P. F. X. Saldanha, and Mr. F. M. Hamilton (Honorary Secretary).

The Minutes of last meeting were taken as read.

Notice calling meeting was read.

A vote of sympathy with Mrs. Tipping was recorded.

U. P. A. Meetings.—Resolution of N. M. P. A.—This meeting is in favour of only one meeting a year.

Pest Act.—The meeting was strongly in favour of this being introduced.

Assistant to Mr Anstead.—After a long discussion on the scheme for a Mysore Assistant the following resolutions were proposed and carried unanimously :—

1. Proposed by Mr. Woodbridge and seconded by Mr. Lake. Resolved : "That this Association is in favour of an Assistant Scientific Officer being appointed for Mysore alone and that the Delegates to U. P. A. meeting be instructed to guarantee Rs.1,200 for 5 years from April 1st, 1912 towards the expenses of the scheme, provided that the assistant be competent to take up the subject of hybridization of coffee and also has a knowledge of Mycology and Agricultural Chemistry. Further, that the assistant be resident on an Estate in one of the three coffee districts of Mysore."

2. "That President and Honorary Secretary should arrange to meet Delegates from N. M. P. A. and B. P. A. to discuss a definite policy to be carried out at meeting of U. P. A."

3. "That the Coast Curing Firms at Mangalore should be asked to subscribe Rs.50 per annum for five years towards the cost of employing a Scientific Assistant to Mr. Anstead, the Planting Expert. The Assistant to be for Mysore alone."

Labour.—Resolved that the matter be discussed with representatives from N. M. P. A. and B. P. A. when they meet our delegates on subject of Scientific Officer's Assistant.

Coffee-Stealing Act.—The meeting has no special modifications to suggest.

The meeting closed with a vote of thanks to the Chair.

(Signed) FRANCIS M. HAMILTON, *Hon. Secy.*

RUBBER.

The International Rubber Exhibition.

In the *Times Weekly Edition* it is remarked :—

" The International Rubber Exhibition in the Royal Agricultural Hall, Islington, has attracted much attention during the past fortnight. A striking feature is the large area and the complete character of the exhibits at the more important stands. The British Malaya exhibit, which occupies a prominent position in the main avenue, makes an admirable representation of the rubber products of this portion of the Dominions. The stand opposite is devoted to a display of the products of Ceylon estates, and the island is also independently represented. Southern India is showing the important part played by the rubber industry. The visitor will learn, perhaps with some surprise, that there is no planting district of Southern India in which rubber is not now grown. The exhibit from the Gold Coast is well placed in the centre of the hall, and on this stand may be seen various samples of the trade rubbers exported from that colony."

Acetic Acid Coagulation on Plantations.

(*Continued*).

Maximum Quantity of Acid.—As is well known, either too small or too large an amount of acetic acid gives an imperfect coagulation, and, having ascertained the lower limit of the latex employed, experiments were made to find the maximum quantity allowable. *Method.*:—10cc. of latex were transferred to each of a series of six test tubes and standard acetic acid (1cc. 0·0543 grams) added in the following amounts: No. 1, 0·3cc.; No. 2, 0·6cc.; No. 3, 3·0cc.; No. 4, 3·5cc.; No. 5, 4·0cc.; No. 6, 5·0cc. After standing half-an-hour the contents of test tubes numbered 1, 2, 3, all showed a complete separation into a clear serum and an accompanying rubber clot; in test tube 4 the serum was decidedly turbid, the contents of 5 still more turbid, while in 6 there was separation into serum and rubber clot, the contents having much the appearance of the original latex. Even after standing 24 hours, the contents of 4 and 5 and 6 showed practically no further change. A similar series of experiments working with 10ccs. of latex and quantities of acid between 3·0cc. and 3·5cc. proved that the upper limit of acidity was reached with 3·2cc. acid = 0·0543 x 3·2 = 0·1737 grams acetic acid. and ignoring the " natural " acid present, it is clear that the working limits of acetic acid for 10cc. of the latex examined lie between 0·0053 x 1·6 = 0·0085 grams and 0·1737 grams, or the maximum amount allowable 0·1737 0·0085 = 20·4 times the minimum. Taking the " natural " acid also into account, in other words basing the calculation on the true acidity of the solutions, the minimum amount 0·009 x 0·0095 = 0·0175 grams acid, and the maximum = 0·009 x 0·1737 0·1827 grams acid, or the maximum 0·1827 0·0175 10·4 times the minimum. It was found that on adding water to test tubes 4, 5, and 6, the turbidity disappeared and a separation into a clear serum and rubber clot took place. This latter fact shows that the factor, $\frac{\text{maximum amount of acid}}{\text{minimum amount of acid}}$ is not a constant, for with the same volume of latex, and a fixed maximum amount of acid, the maximum amount of acid allowable increases with the dilution: it also explains why a large excess of acid over the minimum required can be safely added (so far as a complete coagulation is concerned), if the latex is diluted. Conversely this " factor of safety " would become less if working with normal undiluted latex. The writer hopes to go further into the question of the maximum amount of acid allowable in a subsequent

paper, a shortage of latex preventing a more complete series of experiments being made at the present time.

Absorption of Acid during Coagulation.—Kaye (I. R. J., December 26th, 1910), in an interesting article on the latex from Plumeria, notes that during coagulation with various acids considerable quantities of the latter were absorbed. The writer of the present article finds no evidence that this occurs to any great extent in the case of the latex from Hevea. To test the question, 10cc. of latex were transferred to each of a series of four beakers and the following quantities of standard acetic acid (1cc.,=0·0543 grams) carefully added: 0·32cc., 0·62cc., 1·25cc., and 2·5cc. After coagulation was complete, the contents of the beakers were titrated with deci-normal caustic soda, phenolphthalein being the indicator.

Results:—

	Natural acid in latex calculated in grams acetic.	Grams acetic acid added.	Total acid present calculated as acetic.	Acid found in grams acetic.	Difference.
No. 1 ...	0·009	0·0173	0·0263	0·0262 ...	0·0001
No. 2 ...	0·009	0·0337	0·0427	0·0423 ...	0·0004
No. 3 ...	0·009	0·0679	0·0769	0·0762 ...	0·0007
No. 4 ...	0·009	0·1357	0·1447	0·1434 ...	0·0013

A similar series in which the "natural" acid present was first neutralised with deci-normal caustic soda, gave the following results:—

	Grams acetic acid added.	Acid found in grams acetic.	Difference.
No. 1 ...	0·0270	0·0270	... ...
No. 2 ...	0·0320	0·0315	... 0·0011
No. 3 ...	0·0598	0·0588	... 0·0010
No. 4 ...	0·0706	0·0693	... 0·0013

It is clear that if any distinctly chemical action takes place during coagulation, it must be of the nature of a combination of acid with one or more constituent of the latex, and that such combination gives an acid reaction. The writer prefers to limit the term "absorbed" to such acid as cannot be removed from the precipitated colloid without extreme difficulty, and that there appears to be a small amount of this co-precipitated acid seems probable from the following experiment: 10cc. of the latex were transferred to a separating funnel, 1cc. of acetic acid=0·0543 grams was added, and after coagulation was complete the clear serum run off. The residual rubber clot was then washed with four separate portions of 50cc. distilled water finally run into a small beaker with a fifth portion of 50cc. water, and tritrated with deci-normal caustic soda; 0·1cc. of caustic were required=0·006 grams acetic acid.

Effect of Acid used on Amount of Protein in Finished Rubber.—To ascertain whether the percentage of the protein in the rubber produced could be varied by varying the quantity of acid used to coagulate the latex a series of experiments were made in which the amount of acid used ranged from the minimum amount required to a quantity well beyond the maximum allowable. The method employed was as follows: 20cc. of latex were transferred to a beaker, the necessary quantity of standard acid (1cc. 0·0543 grams) added, and after coagulation was complete, the contents of the beaker thrown upon a quick filter, washed once to collect the curd, the clot thoroughly washed in running water and afterwards rolled into a miniature sheet. This was cut into thin shreds, which were dried over calcium chloride,

and one gram of the dried rubber taken for the proteid determination. The results are given below :—

Acid used for 20cc. latex (1cc. 0·0543 grams acetic acid.)	Protein found in rubber.	Percentage acidity of medium in which coagulation took place.
0·36cc. ...	3·19%	0·184%
0·60cc. ...	3·20%	0·245%
0·90cc. ...	3·49%	0·320%
1·20cc. ...	3·92%	0·392%
6·00cc. ...	3·99%	1·322%
8·00cc. ...	3·98%	1·616%

The series shows that, even working on the plantation lines, it is an advantage to add as nearly as possible the minimum quantity of acid, which will give a complete coagulation. Spence (I. R. J., July 13th, 1908), working with Funtumia latex, states that "if the acid latex is diluted with many times its own volume of water in a separating funnel, the caoutchouc globules apparently coalesce to form fine spongy flakes. These flakes gradually separate and rise to the surface of the watery liquor, which is then drawn off. The flakes of caoutchouc are again shaken up with a fresh quantity of water, and when this process is repeated three times, the caoutchouc is found to be practically nitrogen free. The flakes are then worked up into a solid clot by washing with alcohol or by pressure." The writer has repeated this experiment with Hevea latex but did not succeed in lowering the Proteid content of the finished rubber below 2·74 per cent. The rubber obtained, however, had much the lightest colour of all the samples prepared during the experiments dealt with in this article, and there is no doubt whatever that the colour of rubber is largely influenced by the method of preparation. It may be mentioned that in carrying out the above experiment, it was noticed that during the washing of the rubber flakes a mechanical separation seemed to take place between the proteid matter and the rubber, the former separating out from suspension at a slightly slower rate than the caoutchouc. To test this point the fourth wash-water (50cc. of water were used for each washing) was run off before the suspended matter and completed separated out the liquid evaporated to dryness, and the residue examined for both proteid and rubber. Protein reactions were clearly given, but no rubber was found. The writer intends making a more extended investigation of this interesting problem when a fresh supply of latex is available.

Conclusion.—Summarising, the writer has endeavoured to show that as regards latex the amount of acetic acid required and available is regulated by well defined laws ; that there is no evidence of any decided chemical action between the acid added and any constituent of the latex ; and that as coagulation is carried out on plantations the amount of proteins contained in the finished rubber is not determined (beyond very narrow limits) by the amount of acetic acid added. He has not gone into the question of the relation between the nature of the rubber clot and the physical properties of the final rubber, that fact having been demonstrated by other workers ; but he would record the great difference in the appearance of the acid when working with strong and with weak solutions of latex and acid. As the dilution increases and the acidity diminishes the precipitated caoutchouc settles out in smaller and smaller "flakes" until with such an extreme dilution as that given by a one per cent. solution of latex, the curd may be more fitly described as a white, slimy aggregate of very small flakes of caoutchouc, than as a clot. Finally the writer cannot refrain from expressing the opinion that all the work which has been done on the

coagulation of Hevea latex, by recent investigations, goes to show that coagulation is brought about by purely physical causes. The behaviour of latex towards chemical re-agents is precisely that of other colloid suspensions, and it is rather difficult to see how the precipitation of an extremely small percentage of proteid matter can ever have been considered a sufficient explanation of the coagulation of a comparatively large percentage of the rubber sold.

Rubber Culture in Tobago.

Prepared by the Planters' Association, Tobago, for distribution at the Rubber Show, London, 1911.

The oldest rubber trees in the islands are some 100 Castilloas planted on Richmond Estate in 1889. The plants were obtained from the Botanic Gardens in Trinidad, and most of the Castilloa now being tapped in the island were seedlings from these trees. The original trees are now 21 years old. The largest measures 8 feet 1 inch in girth at 6 feet from the ground, and several others measures 7 feet 6 inches.

The soil of Tobago in the Windward and Northside Districts is mostly a sandy loam, which is generally considered to be the class of soil most suitable for Castilloa, and as this part of the island is very well watered and has an annual rainfall of from 90 to 120 inches the district is without doubt admirably adapted for rubber growing.

In the early days of rubber planting in Tobago, close planting combined with cocoa was the usual method pursued, the rubber seedlings being planted at various distances, 7 x 8 feet, 8 x 8 feet, 10 x 10 feet, &c., with the idea of tapping one-half to two-thirds of them for scrap rubber in the 6th, 7th and 8th years, and then cutting them out. In 1905 there were about 90,000 Castilloa trees growing, but more than half of these were cut out on the above principle, the permanent trees then standing at 16 x 16 feet, 18 x 18 feet, 10 x 20 feet, &c. Planting was gradually extended, and there are now close upon 120,000 Castilloas growing in the island.

Up till 2 or 3 years ago, the cultivation of Castilloa was almost invariably combined with that of cocoa, so that all the rubber trees now being tapped have cocoa planted through them, usually at 12 x 12 ft. This combined cultivation answers very well where the soil is good, and provided that the rubber trees are not closer than 18 x 18 ft. or better still 24 x 24 ft. or 30 x 30 ft.

During the last few years blocks of rubber have been planted without cocoa, but as none of these trees have reached the tapping age, the yield per acre cannot as yet be determined, but it would seem probable that the yield per tree would be more than where the Castilloa is grown with cocoa.

Girth of Trees.

Where the soil is good, and this applies to the greatest part of the cocoa districts, the growth of Castilloa has been remarkably good. A 10-year-old tree on Roxburgh Estate measures 75 inches at 3 feet from the ground. On Richmond Estate A group, of eight 13-year-old trees have an average girth of 5 feet 7 inches. This may be considered very good for close planted trees. On the Lure Estate twenty 14-year-old trees have a girth ranging from 5 feet to 7 feet 2 inches. On Speyside Estate a 5-year-old tree measures 4 feet in girth 3 feet up.

Method of Tapping.

When tapping was first started, the tool generally used was a $1\frac{1}{2}$ inches chisel with an edge very finely ground. Oblique cuts, 1 foot apart perpendicularly up to 7 feet from the ground, were made with the chisel and mallet,

the latex running into a cup or cups fixed at the base of the tree. Various other tools were tried, including the Bowman-Northway tools used for tapping Hevea. These were tried both on the herringbone and spiral groove systems, but proved quite useless on the hard bark of the Castilloa. The chisel is still used on some estates. Others use a "kitchen or "butcher's" knife—a short knife with a wooden handle and a blade, cut square across, about 1¼ inches wide.

With one or two exceptions no tapping was done above 7 feet, but since the publication last year of Mr. H. Smith's Report on rubber tapping in Mexico high tapping has been resorted to. Ladders 6 feet to 10 feet long are used, enabling the tree to be tapped up to 15 or 16 feet.

Tapping is usually carried out by small gangs of labourers, a gang consisting of 3 men, or 2 men and a boy (2 tapping and 1 putting on cups) and 2 women, or 2 tappers and 3 women where the apron is used in place of cups. One of these gangs usually tap 100 to 120 trees for the morning's work, the cost per lb dry rubber varying from 7*d.* to 1*s.* according to the distance apart of the trees, the slope of the ground, &c. It must be remembered that as the rubber trees are surrounded by cocoa trees, the work is often delayed by interfering cocoa branches and hence the cost of tapping is slightly increased.

On Louis d'Or Estates, where high tapping is now being carried out, one man wtth a boy brings in 3 lbs. (dry rubber) each mornings.

Yield of Latex.

The yield varies considerably. 10 to 12-year-old trees planted on good soil, and through cocoa, tapped to 7 feet have given on an average ½ to ¾ lb. dry rubber in 4 or 5 light tappings during the year. A 7 acre field of 11-year-old rubber and cocoa on Richmond Estate, where the Castilloa number 40 to the acre, and the cocoa is planted at 12 x 12 feet, gave an average yield in the ten months from 1st June, 1910 to 31st March, 1911, of 10¼ ozs. dry rubber, the yield of cocoa in the 12 months being 4½ bags of 168 lbs. each per acre. This is equivalent to 15 bags per 1000 trees, a very good return for 11 to 12-year-old cocoa. Valuing the cocoa at £3-15 per bag, and the rubber at 4/6 per lb., this shows a return of £22-10-6 per acre.

Exceptionally good yields have been given by individual trees on the same estate, 1½ lbs. dry rubber having been got from a 16-year-old tree, tapped up to 7 feet in 8 light tappings, and 4 lbs. 2 ozs. from another 16-year-old tree tapped severely up the whole trunk and main branches.

The Castilloas on the Lure Estate have recently been tapped for the first time. The 14-year-old trees gave, in a single tapping, an average yield of 10 oz. dry rubber and some of them yielding 12 to 16 oz. These trees were tapped up to 20 feet from the ground, the tapping tool being used on one-third of the trees only.

Some 10-year old trees on the same estate, also tapped for the first time, and on the same system, gave an average yield of 6 oz. per tree.

Where the soil is not so rich, or the rubber is close planted the yield per annum from 9 to 11-year-old trees is from ¼ to ⅓ lb. dry rubber per tree.

The yield generally is much about the same as that obtained on the large plantations in Mexico, but in comparing the methods of tapping as carried on in Mexico and Tobago, it would appear that, although the yield is much about the same in both places, the Mexican method may do considerably more damage to the tree, the amount of bark incised by the long V-shaped

grooves on the Mexican system being more than three times the amount of bark incised by the method carried out in Tobago.

CURING.

The usual mode of curing is by washing and creaming the latex, after straining, and then drying on wooden frames fitted with a calico bottom. These frames measure about 10 x 13 inches or 1 feet square. They cost very little to make and as the Calico can be used repeatedly for 3 or 4 months the process besides being simple is inexpensive. After remaining for 2 days ou these frames, the sheet of rubber in the frame is dipped into clean water, and the sheet stripped off, and placed in the drying room, where it is smoked. No presses are used, and the rubber is fit for shipment in 6 to 8 weeks. The sheet of rubber when dry weighs about 7 to 8 oz. and is of a pale, or sometimes dark brown colour.

On Louis d'Or Estate, the curing is effected by a centrifugal machine worked by an oil engine, and the rubber is made into sheet, crepe or block.

Mr. H. Smith, of Caledonia Estate, the inventor of a centrifugal machine for curing rubber, turns out by his process a white sheet rubber, which has been valued very highly on the London Market.

HEVEA.

The only comparatively old Hevea trees on the island are a few 10-year-old trees on Richmond Estate. No other Heveas were planted until 4 or 5 years ago, when about 1,000 were planted on Roxburgh Estate. Since then other growers have taken up this species of rubber. The tree grows well, one of the 10-year-old trees now measuring 3 feet 10½ inches and another 3 feet 6 inches in girth at 3 feet from the ground. The 4-year-old field at Roxburgh has made very good progress, and the trees are looking very healthy. There are no data at present to enable a comparison to be made between the yield of Hevea and Castilloa in Tabago, but it may be said that as far as the labour conditions at present go, the Castilloa would seem to be the more suitable. A paying yield can be obtained from that tree in 4 or 5 tappings, whereas to obtain the same amount of rubber from the Hevea, the tree would probably require 20 to 30 tappings, and consequently more labour would be required.

RUBBER AND OTHER CULTIVATIONS.

Tobago offers a very good opening for intending settlers. Soil and climate are good, the rainfall is ample and well distributed throughout the year, and the island is out of the hurricane zone, the last "blow" recorded having been as far back as 1847. The island is practically divided into 2 parts as far as soil, rainfall and cultivation go. The Leeward portion, with an annual rainfall of 60 to 80 inches and a soil partly coral, and partly sandy loam, is well suited for cocoanuts, cotton, tobacco and sugar-cane, all of which grow and thrive well in that district. There are altogether about 300,000 cocoanut trees in the island, the majority of which are in the Leeward District. But many of the cocoa and rubber estates in the Windward district have a considerable acreage in cocoanuts. This part of the island, as has been said, with a rainfall of 90 to 120 inches, is admirably suited for the growing of rubber, cocoa, oranges, cocoanuts, &c., so that intending settlers have an ample variety of staple products to select from for planting. The Honorary Secretary of the Tobago Planters' Association will be glad to give any information regarding the island to any enquirers.—*Proceedings of the Agricultural Society of Trinidad and Tobago.*

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(INCORPORATED.)

The Annual Meeting.

Dr. Morris Travers, F. R. S., Director of the Indian Institute of Science, has kindly invited delegates to visit the Institute some afternoon during the meeting, and it is hoped that, as a result, a time will be fixed for this pleasant break in the ordinary routine of the proceedings of the meeting.

It is expected that Mr. McRae, the Madras Mycologist, will be one of the visitors this year; and possibly he will undertake to deliver an address.

The Planters' Association of Ceylon is also likely to be represented.

Two Exhibitions.

Exhibits for the U. P. A. S. I. Exhibition (mostly for subsequent transmission to the Mysore Dasara Industrial and Agricultural Exhibition) are coming in very satisfactorily. Rubber, Coffee, Cardamoms and Pepper will certainly be represented; some Hybrid Coffee plants are expected; and it is hoped that variety will be assured by means of a small display of agricultural implements, and perhaps one or two other exhibits of a special kind.

Further exhibits are still required, however. More especially, some good samples of Tea and additional specimens of Rubber and Coffee would be welcome, as well as specimens of Rubber Seeds and Tea Seeds. A few photographs are already in hand, but in respect to this section also there is room for a wider selection than has yet come forward.

Some samples of Latex Cups are by this time on their way out from England, and it is hoped that they will arrive before the end of the month.

The U. P. A. S. I. Exhibition can only be a small one, as it is to be arranged within the office premises; but the Scientific Officer and the Secretary trust that planters will help to make it both comprehensive and representative.

Free Analyses of Mysore Soils, &c.

It is announced in the *Daily Post* that the Mysore Agricultural Chemist has issued a circular stating that in order to make the Chemical Laboratory of the Department of Agriculture more immediately useful to the landholders and cultivaters of Mysore, it has been decided to undertake analysis of manures and soils free of charge to all *boná fide* applicants. Besides the analysis, advice will be given as to the use of the manures as well as to their actual value. In the case of soils suggestions as to suitable manures will be sent along with the analysis when so desired.

Those who wish to avail themselves of this advantageous offer have to address the Agricultural Chemist for instructions for collecting and forwarding samples for analysis, and each sample should be accompanied with an accurate description of its source.

Scientific Officer's Papers.

LXXIV.—An Address delivered at a Meeting of the Shevaroy Planters' Association held at Yercaud on 31st July, 1911.

Mr. Chairman and Gentlemen,

I understand that I am 'billed' to address you to-day on the subject of 'Coffee and Rubber,' and indeed in the course of my address I shall have something to say about these products. I wish, however, first of all to deal with what I consider to be the most pressing, and the most important, question which the planters of Southern India have to face at the present moment, and that is, "What are you going to do about a Scientific Department?"

Two years ago last May, as a result of your petitions to Government, I arrived in this country to take up the duties of Scientific Officer and adviser to the U. P. A. S. I. Did you mean this to be only a preliminary step towards a properly equipped Department? I take it that at the time, at least, you did. Since my arrival I have been kept constantly touring about the country and I have now visited each district more than once, and have seen a large number of individual estates in each district. I have given general advice, based on what I have seen, to many planters personally, and to the community at large through the medium of the *Planters' Chronicle*. In addition to this a large and ever increasing amount of work has grown up around this nucleus; a large amount of correspondence passes daily between my office and planters throughout South India, and the *Planters' Chronicle* has become a weekly publication, instead of a monthly one, to which I regularly contribute articles.

Last year another step forward was taken; a laboratory was equipped for my use, and since its establishment work has poured in.

Now a point has been reached where there is far more work than one man can do, and this year at the Annual Meeting the question to be considered is whether you will advance yet another step. You must go forwards or backwards, it is impossible now to remain stationary; it is impossible for me to continue doing the work I have done during the past two years. The strain upon health and brain is too great, and apart from all this I consider that you are not now using me to your best advantage. I ought to devote such training as I have, and such small ability as I have, to solving the many problems which beset planting interests, and to answering the many questions which are put to me to which, at present, I have to reply that I do not know, and am given no time to find out. In fact the time has come when I should be given Assistants to take some of the burden of travelling and correspondence from my shoulders and leave me more time to devote to research work.

My duties are to advise you in planting matters, and I seriously advise you to begin to build up a proper Scientific Department on the lines of similar departments in other countries which have benefitted the planting industries so much.

In the United States of America, which possesses the best equipped Agricultural Department in the world, the colossal sum of 16,900,016 dollars has just been voted for the upkeep of the Department for the current year, and in speaking in favour of this expenditure the Agricultural Minister said, "The conclusion is inevitable therefore, and that conclusion could be made incontestable by innumerable proofs if time permitted, that the farmers of America are applying better methods and getting better results from their labours than ever before. And in devising these better methods, in pointing

the way for better results, the Department of Agriculture has been the undisputed leader, as it should be, and has thus beyond cavil, or question, derived from the money it has expended a percentage of profit to all people which cannot be calculated."

To come nearer home, the Chairman of the Indian Tea Association in his Annual Report plainly stated his belief in the benefit which had been obtained from the Scientific Department. "I regard it as beyond question," he said, "that a substantial part of the increase in productivity is attributable to the improved methods of working which have been popularised by the Scientific Officers." . . . . "When it is remembered that 3 pies per lb. on the Indian crop equals 40 lakhs of rupees per annum, and that even 5 per cent. increase on the average yield of the six years ending 1903 represents, at the prices now ruling, an annual revenue of about 45 lakhs, some idea may be gained of how even small improvements in yield or quality affect the industry."

Your needs are two-fold, firstly research work, and secondly field work, and it is quite impossible for me to do both over such a big field as Southern India with its varying climates, soils, and crops. Let us consider how the case stands with this district, the Shevaroys. You are chiefly interested in two crops, Coffee and Rubber, and about both you clamour for information. For instance, to-day I have been asked to say what is the best manure for Coffee, how it should be applied, when it should be applied, and what quantity should be applied, what shade should be used, and so on. A similar string of questions is asked about Rubber and no doubt, and quite rightly too, you expect exact answers to all these questions from your Scientific adviser.

Well Gentlemen, I can only say that I do not know the correct answers to any of your questions. I am quite ready and eager to discover the answers—if you will but give me a chance to do so. Neither I, nor any man, can come here for a few days, take a flying tour round the district as I am forced to do, because half a dozen other districts are clamouring for me to visit them, and then say exactly what should and what should not be done. I can only tell you what I *think*.

I think that all Coffee should be manured, unless it is badly attacked by disease, in which case special treatment must be accorded it. I am sure that manuring is the best way of preventing the attacks of all diseases. I would plead for systematic manuring, and the dividing of estates into five or six blocks, and manuring each block each year in such a way that each season's manure has a relation to that applied the year before and that which will be applied the year after. In such a system Lime should certainly find a place, and I think that Nitrolim will also prove of great value, since it is an alkaline nitrate and will tend to conserve what little Lime there is in our soils.

To show what I mean by a systematic manuring I will give an example, designed for an estate of two hundred acres, divided into five equal blocks of 40 acres each, the manurial system to extend over a period of five years.

In this system the manures follow one another in the right order and each year's application is dependent upon that given the previous year and that which is to be given in the following year. Moreover, the whole estate gets the same treatment, and the cost of manuring is known exactly over a period of five years.

This system is only intended as an example and it is not contended that it is the best for any particular estate, but similar systems should be planned and carried out over a series of years.

	Year 1.	Year 2.	Year 3.	Year 4.	Year 5.
Block I 40 acres.	Slaked Lime 2 tons per acre (if possible) applied in March. Rs.40 per acre.	Cattle Manure or Fish, or Compost, or Poonac. 4 cwt. per acre applied before the monsoon. Rs.12 per acre.	A Mixture of 2 Basic Slag and 1 Sulphate of Potash. 4 cwt. per acre applied in November. Rs.23 per acre.	A Mixture of 3 Poonac and 1 of Bonemeal. 4 cwt. per acre applied in March. Rs.16 per acre.	A Mixture of 5 Basic Slag 3 Sulphate of Potash 4 Nitrolim. 6 cwt. per acre applied in March. Rs.46 per acre.
Block II 40 acres.	Cattle Manure or Fish, or Compost or Poonac. 4 cwt. per acre applied before the monsoon. Rs.12 per acre.	A Mixture of 2 Basic Slag & 1 Sulphate of Potash. 4 cwt. per acre in November. Rs.23 per acre.	A Mixture of 3 Poonac and 1 of Bonemeal. 4 cwt. per acre applied in March. Rs.16 per acre.	A Mixture of 5 Basic Slag 3 Sulphate of Potash 4 Nitrolim. 6 cwt. per acre applied in March. Rs.46 per acre.	Slaked Lime 2 tons per acre (if possible) applied in March. Rs.40 per acre.
Block III 40 acres.	A Mixture of 2 Basic Slag & 1 Sulphate of Potash. 4 cwt. per acre applied in November. Rs.23 per acre.	A Mixture of 3 Poonac and 1 of Bonemeal. 4 cwt. per acre applied in March. Rs.16 per acre.	A Mixture of 5 Basic Slag 3 Sulphate of Potash 4 Nitrolim. 6 cwt. per acre applied in March. Rs.46 per acre.	Slaked Lime 2 tons per acre (if possible) applied in March. Rs.40 per acre.	Cattle Manure or Fish, or Compost, or Poonac. 4 cwt. per acre applied before the monsoon. Rs.12 per acre.
Block IV 40 acres.	A Mixture of 3 Poonac and 1 of Bonemeal. 4 cwt. per acre applied in March. Rs.16 per acre.	A Mixture of 5 Basic Slag 3 Sulphate of Potash 4 Nitrolim. 6 cwt. per acre applied in March. Rs.46 per acre.	Slaked Lime 2 tons per acre (if possible) applied in March. Rs.40 per acre.	Cattle Manure, or Fish, or Compost, or Poonac. 4 cwt. per acre applied before the monsoon. Rs.12 per acre.	A Mixture of 2 Basic Slag and 1 Sulphate of Potash. 4 cwt. per acre applied in November. Rs.23 per acre.
Block V 40 acres.	A Mixture of 5 Basic Slag 3 Sulphate of Potash 4 Nitrolim. 6 cwt. per acre applied in March. Rs.46 per acre.	Slaked Lime 2 tons per acre (if possible) applied in March. Rs.40 per acre.	Cattle Manure, or Fish, or compost, or Poonac. 4 cwt. per acre applied before the monsoon. Rs.12 per acre.	A Mixture of 2 Basic Slag and 1 Sulphate of Potash. 4 cwt. per acre applied in November. Rs.23 per acre.	A Mixture of 3 Poonac and 1 of Bonemeal. 4 cwt. per acre applied in March. Rs.16 per acre.

By using such a system as the above better results are likely to be obtained than from the present methods of hit and miss, haphazard plans adopted where the manure applied to any field has little or no relation to what it has had in the past or is likely to have in the future.

I think that we at present apply too much manure at one time, and often apply it at the wrong time of year. Soluble mineral fertilisers, like Nitrate of Soda and Saltpetre, should be applied after the monsoon and not before it. All these things I *think*, I want to be able to say 'I am sure!' and it is only when you put me in a position to say that, that you will be getting the full benefit of scientific advice. How can it be done? Quite easily and quite economically! Provide me with a scientifically trained assistant who shall live in your district and make himself thoroughly conversant with local conditions, and let him carry out experiments in the field, watching the results from day to-day. Let me, meanwhile, tackle the problems before us in the laboratory. A combination of the two will assuredly result in our being able to say 'We are sure,' and only by such a combination can this result be obtained. I want to impress upon you that *investigation in the field* is absolutely essential to success when studying problems in agriculture whether they deal with cultivation, manuring, or plant diseases, and it is just this field work which I am unable to do owing to the large tract of country I have to work over.

Mr. Lefroy, the Imperial Entomologist, in a lecture delivered to the Bombay Natural History Society in 1904 on "the present position of economic entomology," speaking of the way insect pests should be studied and controlled said, "It is not generally realised how large is the effect of the 'agricultural' side in the treatment of insect pests; it is a common belief that once an insect is known, and its life history worked out, the best methods for dealing with it must necessarily follow from that knowledge, independently of the way in which the crop grows. That is not so; a remedy is good in proportion as it is adapted to the crop, and to the conditions under which that crop is grown. A large portion of the practical work consists in adapting standard methods to the existing agricultural practice, or in modifying that practice so as to influence some insect pest. Many fine remedies are thought of when an insect pest is studied in the laboratory, which are useless when tested in the field; unfortunately these remedies look so good on paper that they are only too often published, and it is just this class of work that makes planter and cultivator smile and wonder that any one troubles with a science that leads to such absurd and impracticable results. I venture to say that no remedy is likely to be of much use unless it is based on agricultural practice under which the crop is grown; very few are good until they have been *actually worked out in the field*." I want to impress upon you that no method, whether it is concerned with manuring, or cultivation, or the destruction of a pest, is good until it has been worked out in the field.

The problems to be worked out in the field for Coffee are numerous, and in the case of Rubber all is new. Scientifically trained field workers are therefore an absolute necessity.

The matter will be considered by the United Association at its annual meeting this year. What attitude are the Shevaroy delegates going to take towards it?

Our late Chairman, whose sudden death has been such a great loss to us, showed in the circular letter which he issued that we could have three assistants in addition to all we now have by raising the subscription to the U.P.A.S.I. to eight annas an acre. That is, the various subscriptions now

paid will be eliminated and a subscription of eight annas an acre substituted. This is really a ridiculously small sum, and if you do not consider that scientific advice is worth that, or that it will return more than that per acre, the sooner you give it all up the better.

You have established a laboratory more cheaply than any one else has ever done I should say, and if you can get a scientific department for the sum of six annas a cultivated acre I should think that also will establish a record in economy.

What does it mean? Eight annas is about two pounds of Coffee. Do you not believe that an Assistant Scientific Officer living and working in your district will not show you how to add two pounds of coffee per acre to your yield? Why, you waste twenty times that amount now by applyiug the wrong sorts of manure at the wrong time. There is not one of you I believe here present who would not spend the amount on straightening a road on the estate which offended your eye. Is Science of so little value to you? If you added up the total subscription on your estates and applied so much less manure, but obtained a science man instead, I believe you would reap the benefit several times over.

I would ask you to give this scheme very careful consideration, Gentlemen. You have an excellent opportunity now; seize it, lest you have a chance of repenting your lost opportunities at leisure.

I have been asked to give some advice this afternoon as to Coffee shade. I approach the question of shade with a great deal of diffidence because I think that each district, nay almost each estate, must be considered on its own peculiarities as regards its shade. I find that a tree which is looked upon as the best possible shade for Coffee in one district is considered, and rightly considered, the worst of trees for the purpose in another district. I would only suggest that you keep your shade of medium height and aim at having a mixed variety of trees. The Silver Oak is no doubt an excellent shade tree; and it gives a heavy and valuable mulch, but I never see a whole estate under Silver Oak but what I feel afraid, afraid of some disease attacking it. Should it do so it would be almost impossible to check it and the result is too appalling to think of.

I trust that you have duly noted the results obtained in Coorg by applying Nitrate of Soda to Ceará just before tapping. Though not very definite, the indications were certainly that it increased the latex flow, and I should like to see the method tried systematically over a large area.

I hope that this district will make an effort to send a representative exhibit of Ceará Rubber to the U. P. A. S. I. exhibition in August and that it will be sent on afterwards to the Mysore Dasara Exhibition. I should like to see a similar exhibit to that which was displayed on the occasion of my last visit to Yercaud. I may tell you that the U. P. A. exhibition this year will be on a larger scale than last year, and I am anxious to see the Planting Industries fittingly represented at Mysore.

Finally a word about the meetings of the Shevaroy Planters' Association. In looking through the Proceedings of that body I note little but politics, discussions about roads, and labour, and so on, and very little about *planting*. This applies to other Associations also, and to judge by the Proceedings only it is sometimes hard to realise that they refer to *Planters'* Associations. I should like to see, and hear too, planters reading papers at these meetings and discussing manures and rubber tapping, instead of roads. All the lecturing appears to be done by myself, and that is not as it should be. Believe me, you miss half the benefit of an Association if you

do not discuss purely planting matters when you meet. When I take up the Proceedings of similar Associations in other countries, like Trinidad for instance, I always find an account of a lecture by a planter, and the Scientific Officers taking part in the discussions, which is the proper place for them. The part of the Scientific adviser is to guide and direct, and not to lay down the law, as I fear I have been doing this afternoon until your patience must be quite exhausted. I want to see in the future more whole-hearted co-operation among the planters of this district, and to find individuals more actively and publicly associating themselves with field problems. Some of you have hobbies which are inclined towards natural history, and it is only by co-operating with one another and with me, by helping to study insects, etc., in the field, and by making your observations and opinions known through the agency of your Association meetings and the pages of the *Planters' Chronicle* that an advance can be made. The coffee industry of Southern India is suffering from severe competition in the West, and from falling prices, and in my opinion only co-operation and strong combinations among the planters in the East can save it from ultimate ruin.

RUDOLPH D. ANSTEAD,
Planting Expert.

PLANT PATHOLOGY.

Throughout the Tropical world it is gradually becoming more generally recognised that careful treatment of plant diseases is necessary for the successful cultivation of economic plants. As with the study of human and animal pathology, so with plant pathology, the practice resolves itself into the careful observation of the causes and symptoms before the remedial means can be suggested. For the successful treatment of fungus disease a knowledge of the life-history of the fungus causing the disease is of primary importance, in order to know when to attack the fungus, how to dimnish the conditions which are most favourable to its development, and what parts to destroy so as to prevent it from continuing its existance in some future period.

Those methods of treating fungus diseases which are most commonly practised may be summarised as follows:—

1. The destruction of diseased material, which is best effected by burning the diseased parts or by burning them in pits, with or without the addition of lime, should always be practised; it resolves itself into the diminution of the number of spores by which the fungus reproduces itself. In some cases it is necessary to destroy the whole plant, in others only certain parts of the plant need be destroyd. Diseased material should never be thrown on the manure heap; if this is done a recurrence of the disease is secured.

2. Parts taken from the diseased plants should never be used for propagation. Cuttings, bulbs, seeds and tubers produced by diseased plants, if planted, only serve to perpetuate the disease. The disease caused by *Trichosphaeria sacchari* was widely spread by the use of cuttings which were taken from diseased plants.

3. The application of fungicides may be practised in two ways, either as a preventative measure, *i.e.*, before the disease has appeared, or as a curative measure, *i.e.*, for checking the disease after it has made its appearance. The former is by far the more effective measure; it should always be practised when the disease occurs in the neighbourhood or when it has occurred on the plantation in previous years.—A Hand-book of the Fungus Diseases of West Indian Plants: Keith Bancroft, B. A.

Notes and Comments by the Scientific Officer.

124. *Splinters in Rubber.*—Mr. H. P. Hodgson, when writing about the International Rubber Exhibition, calls attention to the fact that "in plantation rubber small splinters of wood are sometimes found and these are very difficult to get rid of even by breaking up the rubber and rewashing" (*P. C.*, Vol. VI, p. 457). As Mr. Hodgson says, the presence of such splinters would have an effect upon the price at once, and they are easily avoided. They can only come from the packing case, since all the latex is carefully strained before it is coagulated and the rubber is usually dried on wire or cloth frames. If wooden frames are used for drying racks they should be planed quite smooth, and packing cases which are planed inside should always be used. This style of packing case has always been recommended, but evidently it is not being universally used. Attention to small details such as this make a lot of difference to Profits, and it is one of the elementary rules of the planting game that the products should be put on the market in the purest and best form, and in the most suitable packages, if top prices are to be commanded. It is to be hoped that Mr. Hodgson's timely hint will receive attention in the future.

125. *Weed Killers.*—With reference to Sc. O. Paper No. 69, a correspondent asks for, "a simple and inexpensive prescription for the destruction of grass and weeds on roads and paths where the accumulation of any chemical noxious to vegetation would not matter," and suggests that, "the ingredients should be obtainable in the bazaar if possible." A strong solution of common Salt applied with a watering can is a very old remedy and a very effective one. The chief objection to the use of salt is that it remains in the ground and absorbs water from the air, making the path wet and sticky on every damp day. A better material, perhaps, is Sulphate of Iron, popularly known as a rule as 'Copperas' (though it contains no copper) or 'Green Vitriol.' This should be obtainable in the bazaar and it is very cheap, its wholesale price being Rs.72 per ton. It is readily soluble in water and a solution containing three pounds per gallon of water should be used; it may be applied from a watering can with a fine rose, or better still, from a sprayer with a mist nozzle. The solution will kill most weeds, but it should be remembered that to eradicate weeds successfuly they must not be allowed to seed, and should be attacked when they are young and the foliage is tender.

Since the above was written my attention has been called to the following prescription for a weed killer published in the *Field* for April 29th:—

"One pound arsenious oxide (white arsenic), one pound sodium hydroxide (caustic soda), six pints water; these are boiled for half an hour, allowed to cool, and then the solution is put into a large stone bottle, corked, and labelled Poison. When a path is to be treated, either a large watering pot with a fine rose, or a barrel with a perforated pipe on the principle of a road sprinkler, is used, according to the area of the path. The mixture is diluted with water in the proportion of 1 pint to six gallons of water, this quantity being sufficient to treat about thirty square yards of path. It is most effective when applied towards evening and when the path is dry."

The effective principle in this mixture is Arsenite of Soda, described in my former paper, and the formula given there for it is more simple. The ingredients cannot, however, be easily obtained, and in addition it is a violent poison

RUDOLPH D. ANSTEAD,
Planting Expert.

THE PLANTER'S LIBRARY.

"The Physiology and Diseases of Hevea brasiliensis,"

"THE PREMIER PLANTATION RUBBER TREE."

As will be seen from the above title, Mr. T. Petch has not written a book that purports to deal comprehensively with the Cultivation of Rubber. Yet, attacking that subject from the standpoint of the "plant-doctor," he has certainly dealt with many of its facets, and has put together a vast amount of information of very great utility to rubber planters. His reason for choosing this position as his base is given in the introduction to the book, wherein he states that "the cultivation of *Hevea brasiliensis* and the systematic extraction of its latex without inflicting excessive injury on the tree, demand a more intimate knowledge of plant structure and physiology than is required in the cultivation of tea, cocoa, and other products." This is an obviously correct view, and it accounts for the fact that a description of the structure and physiology of *Hevea* is included in this work that is intended to deal more especially with the pathology of the plant. Mr. Petch explains further that much of the information he gives is merely an application of general botanical principles, but he adds that experience has shown that it is just such information which is required by those who are now endeavouring to utilise *Hevea* to the best advantage. The information available at present is also to a great extent general because the special botany of *Hevea* has not yet been worked out with any degree of completeness. In writing this book, therefore, Mr. Petch has had a very clear line of thought to follow, and one result is that this latest contribution to the literature of Rubber is among the most valuable ever issued, and it is certainly *facile princeps* among the publications of this character that have appeared during the last year or two.

Wright's "*Hevea brasiliensis* or Pará Rubber" has for some time past been the standard work on the cultivation of the tree and the preparation of its chief product; but the book is to some extent in the nature of a dictionary, useful for reference as to methods of tapping, &c., &c., but failing to discuss the points taken up by the author whose work is now under review. Hence, the new work supplements the old.

Mr. Petch would appear to have determined to make every word tell, and the result is a book to which justice could scarcely be done even in a very lengthy review. In the narrow space at disposal in a single number of *The Planters' Chronicle* it would be impossible to give a review worthy of the book.

For this reason, and because Mr. Petch's work is one that every rubber planter ought to have by him for careful study, the above brief remarks will merely be supplemented by an extract—a small sample of the bulk.

JUNGLE STUMPS.

Mr. Petch writes as follows:—

"By the usual method of clearing jungle land for planting in the tropics, all the stumps of all the trees are left *in situ*. That is a fact which agricultural experts and inventors in temperate climates find some difficulty in realising. In temperate countries the trees are felled; and the stumps are afterwards extracted because the land is to be worked by machinery; but in the tropics machinery is not employed, and therefore this necessity does not exist. Further, tropical trees, expecially on low-lying land, or in 'rain forest,' are often furnished with high buttress roots, and to economise

labour they are cut above the latter. Thus, not only are stumps left to decay by natural means, but they are larger and more numerous than in temperate countries.

"The decay of these stumps is brought about by the agency of fungi, the spores of which alight upon the exposed wood and germinate there. The fungus threads (hyphae) attack the wood, and either gradually consume it or else absorb certain parts of it so that the remainder falls into powder. In either case the fungus feeds unseen upon the tissues of the stump, and in due course constructs fructifications of varied form and colour on the exterior of it. The majority of these fungi are merely saprophytic, *i.e.*, they can live only on dead tissues, but some of them can act as parasites on occasion, and it is the latter which cause trouble. All the root diseases of *Hevea*, tea, and cacao which have been investigated with any approach to completeness have been found to originate on a neighbouring stump; in some cases it is the stump of a jungle tree, while in others it is the stump of a tree which has been planted for shade and then cut down. But there is no known root disease of any of the plants mentioned which attacks the plant directly, *i.e.*, by the germination of spores upon the plant; they all require an external base of operations, and this they find in the dead wood of an adjacent stump.

"The general plan of attack is as follows:—The spores of the fungus are blown on to the exposed wood of the stump, and if the weather conditions are favourable they germinate and their hyphae grow down into it. These hyphae continue growing in the dead tissues until they have permeated both the stem and the roots, and then they spread from the roots of the stump to the roots of adjacent living trees. Some fungi can only spread to other plants if the roots of the latter are in contact with those of the host stump; others, however, can spread freely through the soil, drawing food from the supply in the stump which served as a base. Each stump thus affords a centre of disease, spreading destruction in an ever-widening circle.

"In addition to spreading the disease by means of radiating fungus hyphae in the soil, each infected stump produces fructifications of the fungus, and these liberate spores which convey infection to other stumps. In some cases fructifications are produced at intervals from shortly after the stump is first attacked until the time when it is completely decayed; while in the case of other fungi the stump only bears fructifications when it is in the last stages of decay.

"If there were no dead stumps there would be no root diseases either in *Hevea* or tea. But it is not an easy matter to get rid of them, and whatever method is adopted the cost is high. They have, however, been got rid of in certain cases, both in Ceylon and Malaya. In 1906 I recommended that course in dealing with *Fomes semitostus*, and on one affected estate in Ceylon all the stumps were dug out. Several estates have since adopted the same treatment in Malaya, while others are only deterred by lack of funds."

On a later page the following remark appears:—

"At the annual meeting of the Pataling Rubber Estates Company, in April 1910, it was stated that the expense of uprooting stumps and removing all dead wood came to a total charge, 'once and for all,' of less than sixpence for each rubber tree; 'that is not a very heavy insurance to pay to rid the trees of what may cause a great deal of injury.'"

DISTRICT PLANTERS' ASSOCIATIONS.

Shevaroy Planters' Association.

A Special General Meeting of the Shevaroy Planters' Association was held at the Victoria Rooms, Yercaud, on the 31st July, 1911, to meet Mr. R. D. Anstead, the Planting Expert.

PRESENT.—Messrs. F. Carey, E. Dickins, W. Hight, A. B. Kundaswamy, C. G. Lechler, J. C. Large, E. Large, W. Rahm, C. Rahm, Revd.—Rochet, Messrs. W. Reilly, F. D. Short, C. K. Short, L. E. T. Short; (visitors) Messrs. R. B. Foote, H. Gompertz, —Reilly. Chas. Dickins, Honorary Secretary.

The Honorary Secretary, on opening the meeting, offered Mr. R. D. Anstead a hearty welcome on behalf of the Association. He also informed those present that he was in a position to state—in connection with the Sc. O. Scheme—that 950 acres were for an 8-anna cess, and 3,500 acres against it.

Mr. R. D. Anstead, B.A., then delivered a lecture which is published as Sc. O. Paper lxxiv on pp. 474-479 of the present issue.

At the close of the lecture an informal discussion took place, lasting for some time.

Proposed by Mr. C. G. Lechler :

That a hearty vote of thanks be accorded to Mr. Anstead for his very interesting and instructive lecture.

Carried unanimously.

(Signed) CHAS. DICKINS,
Hon. Secretary, S. P. A.

EXTRACTS FROM BRITISH CONSULAR REPORTS.

Tea in Switzerland.

The imports of tea in 1910 amounted to £62,000, the net weight thereof being 449 tons. This is an increase in quantity of 35 tons and in value of £4,500 on the imports of 1909. The imports of tea from China are still in excess of those from British India. In 1910 the imports from the former country amounted to 231 tons, as against 200 tons from British India. The imports of India tea increased by 35 tons.

Attention is again called to the fact that parcels of tea weighing less than 5 kilos. (11 lbs.), gross weight, are subject to the higher duty of 40 fr. per 100 kilos., whereas all parcels exceeding 5 kilos. in weight pay a reduced duty of 25 fr. per 100 kilos.

Coffee in Sao Paulo.

Coffee represents practically the sole export from Sao Paulo, the combined values of the other items of export representing but little over ½ per cent. of value of total exports. Hence it follows that the value of the export trade of this State during any given year is dependent upon two factors, namely, amount of coffee exported and market price of same.

During the year 1910 the quantity of coffee exported from Sao Paulo was less by nearly 4,000,000 bags than during 1909, the amount exported during 1910 having been limited, in accordance with the working of the valorisation scheme, to 9,500,000 bags, as against 13,453,104 bags exported during 1909.

RUBBER.

The Future of the Rubber Industry.

In the course of an article on the above subject and dealing specially with "Changes Anticipated," Mr. Herbert Wright states in the *Times Weekly Edition*:—

Great Britain leads easily in point of acreage under rubber in its own possessions, and is closely followed by the Dutch East Indies in area, but not in age. The Dutch planters did not take up the cultivation of *Hevea* on a large scale until it had been proved a success on adjacent British territory; and, in fact, much of the area under *Hevea* in Java, Sumatra and Borneo is owned by companies registered in England and Scotland. Germany has planted *Hevea* in Samoa and New Guinea, and *Manihot* and *Funtumia* in Africa. During recent times many of the producing or well-advanced estates in German colonies have been taken over by London companies. This is only one of the ways in which the new plantation industry has altered international conditions in the tropics. Great Britain seems likely to increase its control over supplies of rubber in the East, for while it is true that the United States are credited with conspicuous activity to-day in Sumatra, this country must continue to lead, since it is already in possession, in Ceylon, Malaya, and India alone, of more than half the world's total planted acreage, a good part of which is already producing.

YIELDING CAPACITY OF PLANTATIONS.

The facts that Ceylon alone produced 1,600 tons of plantations rubber last year, as against 75 tons in 1905, and that the East—mainly Malaya and Ceylon—turned out 1,800, 3,850 and 8,230 tons respectively in the years 1908, 1909 and 1910, point to the likelihood of conspicuous developments in the next three or four years. . . . I believe that in the most favourable parts of Malaya a yield of one ton per five acres will ultimately be annually obtained; in less favoured parts of Java and Ceylon I estimate the yield at one ton per ten acres; for reasonably good estates in Sumatra and South India I anticipate the yield to be between the two estimates here given. In other words, deducting a certain percentage from the world's planted acreage, I estimate that the balance in full bearing will each year yield far more than is now annually produced from wild sources. . . .

IMPORTANT CHANGES IMMINENT.

It should be clear from this that the day is near at hand when the balance of power in the crude rubber market will be considerably changed. . . . Both Brazil and Africa alike realize that the shadow of huge plantation supplies is upon them, and that sooner or later the abundance of rubber will have its effect on price. Inferior-grade Africans, which make up a good part of that continent's supply, must suffer first; then the better grades from bushes and trees other than *Hevea*, and finally must come a struggle between rubber from the wild and from the cultivated forms of *Hevea*. The supply, in the event of low prices, will be most seriously curtailed from Africa; it will also be evident in tropical America, but not in the same degree. The Brazilian authorities are giving all possible aid and encouragement to those concerned with the collecton of rubber in that part of the world, and their country can always be relied upon to give a fair yield. Complete extinction of the wild rubber crops from the forests of Africa or America there cannot be, in virtue of the existence of a population in both areas which must find some means of employment. Yet a curtailment in supplies from wild areas is a certainty, when Eastern plantation crops shall be coming over at the rate of 3,000 tons per month.

Lateral Connection between Systems of Lactiferous Tubes.

Mr. James C. Harvey writes to the *India-Rubber World*:—

"I note that you have offered a cup as a prize for the best system or method of tapping *Castilloa elastica*. I am exceedingly interested, but for reasons which will be apparent later on, feel debarred from competition. No such sense, however, restrains me from calling the attention of planters to the following method which at least has the merit of established practice in certain details. It is really a combination of two methods, in the first instance avoiding the continuous excision of bark, and in the latter reducing the cost of collection of latex.

"The accompanying sketch will enable the reader to easily grasp the details of this method. So far as known to me all practical work done in Mexico up to date involves a more or less continuous excision of bark. In Tobago, British West Indies, however, the writer was informed by Mr. Harry S. Smith, a representative of the Trinidad Government, that their practice involved the use of a chisel and mallet. A series of perpendicular cuts are made, as shown in the sketch, the latex thus dripping down the surface in an irregular manner and necessitating the use of an adjustable apron at the base of the tree, from the surface of which the latex was scrapped off with spoons. Upon inquiry Mr. Smith stated that several people were employed in the operation of tapping each tree, apparently a much heavier tax upon extraction than with the Mexican method.

"Since it seems to be a pretty well-established fact that wound response, as occurring in the case of *Hevea brasiliensis*, cannot be hoped for with *Castilloa elastica*, a continuous excision of bark cannot be lightly regarded and the merit of the Tobago method becomes apparent. It has occurred to me that the formation of permanent channels and further excisions of bark by combining the Tobago method of chisel cuts between the established channels, offers a promising field for further testing of this suggested method.

"A remarkable fact in connection with the Tobago method is that a series of chisel cuts made, say, eight inches, one above the other, and laterally, say, four inches apart, seems to secure all the substantial flow, as upon essaying an intermediate series within a few minutes after completion of the initial cuts referred to, scarcely any latex is secured, which might indicate some lateral connection in the system of lactiferous tubes.

"It is hardly practicable to apply the above system to trees that have become much scarred by previous tappings with resultant excrescences of renewed bark. The method contemplates in its application clean virgin trees, such as would be dealt with in the first tapping year of a planting *Castilloa elastica*, and also a careful marking out of the position of the permanent channels:—

The Editor of the *India-Rubber World* comments as follows:—

"If Mr. Harvey's suggestion is as practical as it appears at first blush, it will be of the greatest value. The apron around the base of the tree has always seemed a trifle cumbersome, and slow and difficult to adjust. If, therefore, by a system of permanent channels in the bark the latex can be led to cups placed at the base of the tree it will be much simpler and far more economical. The suggestion of possible lateral connection between the lactiferous systems is in the line of valuable discovery and should be thoroughly investigated."

The Rubber Industry in Para.

LAWS FOR ITS PROTECTION AND EXTENSION.

H. M. Consul at Pará (Mr. A. Pogson) reports that three Laws (Nos. 1,179, 1,180 and 1,181), of date 17th May have been enacted in the State of Pará for the protection and extension of the rubber industry and trade and of agriculture generally.

The first Law authorises the Government to grant favours, including exemption from taxes except those on export, for a period not exceeding 15 years, to persons undertaking to establish in the town of Pará factories for the refining of rubber, or agreeing by means of new and improved methods to wash, rectify and purify india-rubber so as to permit of the export of one grade only, of the first quality.

The second Law authorises the Government to enter into agreement with the Government of Amazonas and the Federal Government for the contraction of a foreign loan, of 10 years duration, not exceeding £6,000,000, at a maximum interest of 5 per cent., upon the responsibility of the two States and the endorsement of the Federal Government; this loan is to be used to protect the production of rubber. To provide for the interest and amortisation of the loan, an additional tax of 400 reis per kilog. (about *3d.* per lb.) of rubber exported is established. The Government of Pará is also authorised to enter into agreement with the Government of Matto Grosso with a view to the establishment of this additional tax upon the product of that State also.

Should it not be found possible to raise the loan above-mentioned, the State Government is authorised to contract one up to £3,000,000 with interest at 5 per cent., upon the responsibility of the State, and guaranteed by the additional export tax.

The third Law authorises the Government of the State to guarantee a maximum rate of annual interest of 6 per cent. upon a capital of £3,000,000, to be emitted in series during 30 years, to an agricultural mortgage bank to be founded in the town of Pará.

H. M. Consul points out that whether the security of the Federal Government has been or will be accorded in connection with the proposed loan of £6,000,000 is not yet known.

The Advantages of Pressed Rubber.

We see from Mr. Hy. C. Pearson's (Editor of the *India-Rubber World*) book, 'The Rubber Country of Amazon,' that Dr. Huber, well known as the Director of the Museu Goeldi, at Pará, confirms Dr. Olsson-Seffer's theory respecting the improvement of raw rubber by continuous pressure. It was this theory that caused presses to be adopted so freely by some estates, as the rubber could then be left under pressure, in the boxes, until it was thoroughly set. Dr. Huber also emphasizes the double advantage of smoking and pressing the rubber. He explains that greater 'nerve' in Amazon smoked rubber made up into 'pelles,' *i.e.*, the well-known balls or 'hams' from fhe Amazon valley, is caused by the rubber, from the time the *pelle* is first formed, undergoing a natural, continuous, solidifying pressure caused by the evaporation of the water from the outside layers and their consequent contraction. 'This theory,' adds Mr. Pearson, 'seemed to me worthy of note. I remember that when gathering Castilloa rubber in Panama, we rigged up some crude presses to get the water out, and in some instances where the rubber was left for a long time, its strength was greatly enhanced.' . . . The whole question of putting-up of the rubber for transport and storage is still in *embryo* but apart from the acknowledge waste from rubber surfaces exposed to the air, blocked rubber, either for transport, or stored away in warehouses waiting to be made up, has many advantages over ribboned rubber, as crepe, &c.—*Tropical Life*.

OFFICIAL PAPERS.

Progress of the State of Sao Paulo.

It would seem, observes Mr. Consul O'Sullivan-Beare, in the course of a highly interesting report on the Trade of the State of Sao Paulo for the year 1910, as though the mercantile community of the United Kingdom as a body have hitherto failed to realise the immense progress made by the State of Sao Paulo within recent years, and to appreciate rightly the importance of the State at the present time as a market for British goods and as a field for profitable investment of British capital.

I am led to that conclusion by observing the small number of representatives of British firms and of British capitalists who visit Sao Paulo and the fewness in the number of inquiries of a commercial nature which are addressed to the Sao Paulo Consulate. It is but rarely that British capitalists or their representatives take the trouble to visit Sao Paulo with a view to studying personally the economic conditions of the State. On the other hand I have remarked the arrival here during the past year of numerous French and American capitalists, all of whom have been most favourably impressed with the conditions existing in this State for investments on a large scale.

As regards the matter of inquiries of a commercial nature, I may mention that the number of such inquiries addressed to the Sao Paulo Consulate during the past year was only about one-third of the number of such inquiries which are addressed annually to some other British Consulates in Brazil.

It may not be unprofitable, therefore, if I set forth here certain facts and figures tending to demonstrate the extraordinary progress made by the State of Sao Paulo during the past 20 years.

The State of Sao Paulo is about equal in size to the Kingdom of Italy, with a superficial area of some 290, 876 square kiloms.

In the year 1887 the population of the State consisted of 1,221,394 inhabitants, or about 4 to the square kilometre. In the year 1907 the population of the State had doubled, amounting to 2,550,000 inhabitants, or 8 to the square kilometre.

It was during the year 1887 that the stream of immigration into the State of Sao Paulo commenced to assume important proportions. During that year there arrived in the State over 32,000 immigrants. During the following eight years the stream of immigration continued to increase year by year, till in 1895 it reached its maximum with 149,745 arrivals. It has been estimated that within a period of 20 years (1887—1907) the total number of immigrants into Sao Paulo amounted to over 1,250,000 persons, of whom a very large proportion settled down permanently in the State. The immigrants in question were composed of various nationalities—Italians, Spanish, Portuguese, Austrians, Hungarians, Germans, Swiss and Russians. The fusion of those several races has endowed Sao Paulo with a fine, virile type of population, which constitutes one of the most valuable assets of the State.

The intellectual condition of the population of Sao Paulo improved in a remarkable manner during the 20 years in question.

Thus, in 1887 there existed throughout the State 1,039 primary schools, with a total of 24,732 matriculated students. In 1907 there existed in the State 1,478 schools, with a total of 70,336 matriculated students. The diffusion of education manifested itself by an increase in the number of

citizens eligible to vote. Thus in 1887, electors constituted only 1·5 per 1,000 of inhabitants; in 1907 the proportion had risen to 29·89 per 1,000.

Development of railways has constituted one of the most potent factors in the progress of Sao Paulo. In 1887 there were only 1,160 miles of railway in operation; in 1907 there were 2,550 miles.

As the result of increase of population and of development in means of communication, the agricultural production of Sao Paulo showed enormous increase during 20 years. Between 1887 and 1907 the output of coffee increased fivefold, output of rice increased twentyfold, and output of sugar increased fourfold.

The fascination exercised by coffee upon the Sao Paulo planters became so great that, very unwisely, they came to concentrate all their energies upon cultivation of the famous *rubiacea*, to the neglect practically of other products. The following table shows the extraordinary development of coffee cultivation in Sao Paulo during 20 years, *viz*:—

		1887.	1907.
Area under cultivation ...	Acres	5,156,338	19,250,000
Coffee plants ...	Numbers	210,941,614	700,000,000
Output of coffee ...	Tons	161,654	674,863

In 1887 agricultural operations in Sao Paulo were performed by a body of 167,329 slaves, all of whom were liberated by the monarchy during the following year without payment of any compensation to the slave owners. The great majority of the slaves liberated in Sao Paulo migrated to the Northern Stables of Brazil, so that at the present day the coloured element represents but a very small proportion of the total population of the State.

In 1907 the labouring population of Sao Paulo consisted of some 414,576 persons, of whom about 194,495 were native Brazilians, and the balance were of foreign nationality.

In the matter of manufactures the State of Sao Paulo has made rapid progress during 20 years.

And this has led to a large increase in the import of coal, *viz*:—

	Tons.
1887	2,539
1897	220,705

The most striking proof of the immense progress made by the State of Sao Paulo during the past 20 years is furnished by the returns as to trade of the State during that period, *viz.*:—

	1887. Milreis.	1907. Milreis.
Exports	85,106,444	353,919,960
Imports	23,247,205	188,409,280
Total ...	108,353,649	542,329,240

The above table demonstrates the remarkable fact that the total trade of Sao Paulo quintupled itselt within a period of 20 years.

It is to be noted that in Europe most countries require a period of at least half a century to double their total trade.

It is evident that by virtue of its fertile soil, of its favourable climate, of its geograghical position and of the energy of its inhabitants the State of Sao Paulo is assuredly destined to play a preponderating rôle in the progress of Brazil as a whole.

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The Annual Meeting.

On the 28th instant, beginning at 11 a.m., the usual Committee meeting will be held at the Mayo Hall, Bangalore. The Annual Meeting is likely to be opened at 3 p.m. at the same place. Wednesday afternoon, the 30th instant, has been suggested for a visit to the Indian Institute of Science, in response to the invitation of Dr. Morris Travers, F. R. S.; and it is expected that the annual Planters' Dinner will take place, at the West End Hotel, on Thursday, the 31st instant.

The International Rubber Exhibition.

Mr. J. A. Richardson's report, dated 20th July 1911, reads as follows:—

"The International Rubber Exhibition was opened officially by Sir Henry Blake on the 26th of June and proved a great success and was a revelation to all connected with the Industry.

"There was a good representative gathering at the opening and I saw several South Indian men, amongst others our late Planting Member, Mr. H. P. Hodgson, who was on the Exhibition Committee.

"The whole space of the Agricultural Hall was fully taken up, and it would take too long to describe each and all of the various Exhibits, but I think every country which could claim to grow rubber was represented as well as many of the chief Rubber Companies.

"Brazil, the Belgian Congo and the Netherlands (including Java and Sumatra) had very fine courts, but naturally our nearer neighbours, Ceylon and the Straits, were of special interest to me.

"Ceylon as usual put a very fine show, as also did the Straits. They both had some very fine samples of Rubber in bulk, which was where we failed, as our samples were much too small, in some cases consisting of 4 or 5 sheets or biscuits, which, considering the quality was there, was rather a pity.

"Mysore sent in a sample of Ceará but it showed signs of having been packed before it was dry and the biscuits had stuck together.

"Coorg made a good show with Ceará but like other friends on the Shevaroys made their sheets and biscuits much too thin. They looked very nice but commercially were not of much value though the rubber was excellent.

Without doubt the finest sample of Rubber in our court and perhaps one of the best in the Exhibition was from the Mooply Valley Rubber Company, and there was little doubt according to brokers and experts that had there been sufficient quantity to enter it for the competitions it would certainly have won a prize.

"Next in favour was Kuttikal, which had a reasonably sized sample, followed closely by the Travancore, Stagbrook, and Orkaden Companies and Mr. Murphy's Yendayar Estate, which has good even samples, but much too small and most of them showing signs of not being sufficiently dry. The Rani Company had a good though most minute sample, which was the only machine-made rubber from South India. A good deal of surprise was expressed that our Premier Rubber Company in Travancore, the Periyar, did not exhibit, and I think there were several others who might have sent in samples. We made the most of what we had however and with the help of photographs mostly supplied by the Mooply Valley Rubber Company and one large frame of photos. from the Periyar Company made the court as attractive as possible.

"There were also samples of coffees from Mysore and Coorg and tea from Glenmary Estate, Peermade, and Poonmudi in South Travancore.

"Specimens of South Indian timbers kindly supplied by Messrs. Aspinwall & Co., Ltd., Cochin, for the previous Exhibition and other products all showing the fertility of South India added interest to our court.

"I was disappointed in not getting some sporting trophies which I understand were coming, otherwise I would have arranged for them on this side, and the only relics of the chase consisted of two stuffed crocodiles from Travancore, which were much admired and on more that one occasion I heard several visitors ask from what part of them rubber was extracted.

"On Monday, the 3rd July, we held a meeting of the South Indian Committee and others interested and I arranged the following programme of practical demonstrations which were of great interest to some of our Directors who had no practical knowledge of plantation work :

2-45 p.m. Tapping live trees at the Mexican court.
3- p.m. Demonstration on Chemical Coagulation.
3-20 p.m. Demonstration of washing and creping by Messrs. David, Bridge & Co.
3-40 p.m. Motive Power, Hornsby Oil and Suction Gas Engines.
4- p.m. Meeting.

TEA, ETC.

4-45 p.m. Visit to South India Court.
5-15 p.m. Washing demonstrations by Messrs. Francis, Shaw & Co.
5-35 p.m. Motive Power, Crossley's Oil and Gas Engines.

"It was quite a representative gathering of South Indian men and others interested, and the following were present :—

Messrs. Acworth, Knight, Valentine, Russell, Sanderson, Harris, Clark, Nicholson, Grey, Gudgeon, Graham, Laurie, Errol-Sinclair, Arbuthnot, Proudlock, Lindsay and self. Our photograph was taken at the time, of which a few copies have been sent out to our Secretary and copies can be had at Rs.3 each. A separate photo. of the South Indian Court alone was also taken, and copies of this can be had at the same price.

"We were again fortunate in securing the services of Mr. J. A. R. Clark, an old Travancore planter, who looked after our interests at the last Exhibition, to do the same for us this time. Knowing South India well he was able to give visitors information regarding our different exhibits and climatic conditions of the country.

"The pamphlet, of which 500 are being sent out to India, was distributed freely during the Exhibition and was much sought after by those interested in South India. I would recommend getting a dozen or so specially bound and presented to different officials both in Madras and Native States.

"For the benefit of one or two who were sceptical as to the use or advantage to be gained by such an exhibition I should just like to say a word or two.

"To begin with I may say the magnitude of the Exhibition was beyond all expectations and for planters who happen to be at home there was a fund of information at hand which might never be gained again in a lifetime as regards machinery and manufacture.

"There were practical demonstrations of coagulation with different forms of chemicals, smoking, and by Gordon's Centrifugal coagulators with latex shipped home for the purpose. Then again there were various kinds of washers all working on rubber coagulated on the spot, different methods of drying, and down to patent chests for packing. There were quantities of tapping knives and collecting cups of all shapes and forms, so that the whole process from beginning to end could be demonstrated on the spot.

"I can still hear a particular friend of mine who attended our last meeting grumble and say he was not there to see it for himself, and my reply to him is to order at once a copy of the book to be published as a result of the various conferences and lectures which took place during the Exhibition.

"So much from a planter's point of view; and we will now look at it from the manufacturer's side of the question. Most of the largest firms were represented, and they could see for themselves, by practical demonstration how our rubber is treated from start to finish.

"Then put the planters and the manufacturers together in conference, as we had on several occasions, and I think even the most sceptical will admit that there was some good in the Exhibition.

"Besides this several inquiries were made by French and German firms as to whether any of our rubber crops could be sold direct, and for one or two marks they were prepared to buy forward at a very substantial rise on present prices. These gentlemen were of course referred to the London agents of the Estate or Company concerned.

"The actual cost of our exhibit I cannot yet give you, but I expect it will be about £420. . . .

"I did not know exactly how much we had though I saw from the *Chronicle* that it was considerably over the £400 we were limited to before I left India. I am sorry I had no official intimation of this point, as I could have spent another £50 or £60, I am sure, with advantage.

"I am greatly indebted to Mr. Gudgeon, of Cochin, and Mr. Weymouth, of Coorg, who spent a great deal of time with me inspecting different types of machinery.

"I attended the Exhibition daily from the 24th June up to the 13th July and consider my time well spent.

"The Association's thanks are due to Messrs. Rowe, White and Company and more especially to Mr. Errol-Sinclair of that firm for the excellent way all the arrangements for our exhibit were carried through.

"I should now like to have my name added to resolution which I know will be one of the first duties of our present Chairman, and that is a vote of sympathy with Mrs. R. D. Tipping, widow of our late Chairman, who was cut off from amongst us in such a sudden and unexpected way.

"Trusting you will have a successful meeting and hoping I may be able to join in the next."

Scientific Officer's Papers.

LXXV.—Reports on Agricultural Stations in the Madras Presidency.

A batch of Reports, issued by the Madras Agricultural Department, dealing with the work done at the various Agricultural Stations during 1910-1911 have recently come to hand. The crops dealt with are chiefly those grown by ryots, and the experiments with them are conducted under conditions suitable for the ryot to adopt. There are some things, however, of general interest, and the Taliparamba report contains some interesting matter about Pepper cultivation. It is reported that:—

"As far as the Pepper crop is concerned, the season was not favourable. The break in the weather in July when the vines were in full growth and when pepper was setting, started shedding of pepper spikes, and the continued damp weather conditions up till the end of November favoured the disease known as 'Pollu' caused by a flea beetle larva, which burrows into the green peppercorn. This, in all low-lying plots, caused much damage, though a certain amount of light pepper was obtained.

"After last year's heavy pepper crop, a considerable reduction in yield was this year expected. The Utherancotta variety of vines, for instance, gave practically no crop. This was expected since this variety only bears in exceptional seasons such as 1906 and 1910 were. Comparing this year's yield with that of 1907, the only other year which followed an abnormal yield when vines of all classes bore heavily, the crop this year is good. The 1907 crop gave a total yield of 1,097·75 Madras measures of green pepper against a yield of 2,457·875 Madras measures in 1911. This latter yield does not include the crop picked from young vines planted since the farm was acquired. It is satisfactory to note also that very few vines died out from over-bearing, while in 1907 the pepper on several of the more exposed plots completely disappeared. Since over the major portion of the pepper garden no experiment has been done, this shows that proper care and attention even to old gardens pays handsomely. The 1907 yield followed that obtained after these gardens had been acquired when the majority of them were in a very neglected state."

The following table shows the yields obtained from the various manurial and cultural plots of Pepper in Madras measures. There is nothing in the report to indicate the size of these plots, or whether they are all the same size, or the variety of the pepper grown on them. This detracts somewhat from their value, and similar check plots which had been unmanured in each case should be included in the series.

	Yield in Madras Measures.				
	1907.	1908.	1909.	1910.	1911.
Lime and Leaf Mould ...	$5\frac{3}{4}$	$28\frac{1}{2}$	36	78	91
Fish Manure ...	$37\frac{3}{4}$	$72\frac{1}{4}$	$86\frac{1}{4}$	$156\frac{1}{2}$	$98\frac{1}{2}$
Ashes ...	$28\frac{1}{2}$	$61\frac{3}{4}$	$61\frac{1}{2}$	$114\frac{1}{4}$	$36\frac{3}{4}$
Cattle Manure ...	$2\frac{3}{4}$	$32\frac{1}{2}$	$35\frac{1}{2}$	$83\frac{1}{4}$	$43\frac{3}{4}$
Gingelly Oil Cake ...	$1\frac{3}{4}$	$13\frac{1}{2}$	27	$50\frac{1}{4}$	$12\frac{3}{4}$
Leaf Mould ...	7	$52\frac{1}{2}$	$21\frac{1}{4}$	73	$28\frac{3}{4}$
Leaf Mulch ...	19	50	19	99	$95\frac{1}{4}$
Mounding ...	$14\frac{1}{2}$	75	39	103	24

The following comments are made upon each of these experiments :—

"*Manurial applications to pepper.*—This season has brought out fairly clearly the effects of manurial applications on the vigour of the vines. In nearly every case, the yield under experimental and in non-experimental plots is less this year than last. The plot to which lime and leaf-mould has been applied is, however, a striking exception and this has shown great improvement in yield each year since the manurial application was commenced in 1908.

"*Fish Manure.*—Though it has given only 63 per cent. of last year's yield, is promising. The vines in the plot are healthy and vigorous and show no sign of suffering from over-bearing in 1910.

"*Ash Manure.*—The effect of ashes as a manure is not good. The vines here are pale and sickly and have evidently suffered much from over-bearing in 1910.

This plot adjoins the fish manure plot and is very similar to it in aspect, shade, gradient, and variety of vines.

"*Cattle Manure.*—This plot contains many bad vines and the results are not of much value in consequence. Moreover, unless the gardens are easily accessible, it is a costly method of manuring and has a further disadvantage in that it attracts wild pigs, which root out the manure and damage the vines. The plot cannot, however, be said to have suffered from over-bearing like it did in 1907.

"*Gingelly Oil-cake.*—This Manure which is the only oil-cake available on the West Coast, with the exception of cocoanut cake, is too expensive as a manure and the yields obtained show that it is not so effective as many other cheaper manures, and the vines have evidently suffered from over-bearing.

"*Leaf Mould.*—The plot on which this has been tried is low-lying and is situated in a part of the garden where 'Pollu' attack was very severe. The vines here have improved greatly and this is not shown by the yields.

The preponderance of the Kalluvalli variety is clearly shown in these yields which are alternately high and low.

"*Leaf Mulch.*—This shows an improvement over last year. This is partly due to the plot being planted chiefly with the Kalluvalli variety which gave its previous heavy yield in 1909. The plot has improved much, possibly more from the protection from heat which the soil has through the hot weather.

"*Mounding.*—The results do not indicate the improvement which is apparent in this plot, owing to the very severe 'Pollu' attack." "

In the report on the Koilpatti Agricultural Station there is some interesting information on the relative advantages of different methods of preserving cattle manure which is worthy of study by planters in connection with the advice I have given about conserving cattle manure on the estate, and the making of composts in pits. Three methods of preservation have been tested.

In the first method the cattle are kept in a loose box, the floor of which is sunk, and some two or three feet of well compacted manure is allowed to accumulate beneath the animals.

In the second method the manure is removed each day and stored in a covered pit, into which the urine is allowed to drain, and dry earth is occasionally thrown on it. This method is particularly well adapted to estate conditions and should be used in connection with sheds where cattle are occasionally kept, and with the stables, while line and yard sweepings,

refuse from the bungalow, &c, should be added. In the third method the manure is stored in a heap, unprotected from rain and sun. Cattle manure collected after the local method and unpreserved in any way is compared with these, and the analyses of the manure, shown in the following table, very forcibly bring out the difference and show the immense value of properly preserving this valuable form of fertiliser :—

ANALYSIS CALCULATED TO A DRY STATE.

	Box.		Pit.		Heap.		Local
	average for 6 years.	1910-1911	average for 6 years	1910-1911	average for 6 years.	1910-1911	1910-1911
*Organic Matter...	57·55	68·62	44·22	67·76	36·80	49·75	53·92
Phosphoric Acid...	0·922	0·96	0·791	0·81	0·70	0·66	0·80
Potash ...	3·306	3·58	2·224	2·83	1·369	1·26	1·19
Insoluble Matter ..	29·11	18·87	40·31	19·37	52·85	41·03	37·27
*Containing Nitrogen ...	1·995	2·32	1·22	1·12	0·749	0·73	0·59

When translated into actual outturns of crop, the same advantage is shown up, as will be seen from the following table. The quantity of manure applied to each acre was that produced from two pairs of cattle :—

	Cotton	Cholam.		Cumbu	
	1907-1908	1908-1909		1910-1911.	
	lbs. per acre	Grain : lbs. per acre	Straw : lbs. per acre	Grain : lbs. per acre	Straw : lbs. per acre
Box Manure ...	1045	220	4032	801	1692
Pit Manure ...	1049	272	4206	788	1700
Heap Manure ...	1053	204	3938	626	1348
No Manure ...	514	72	2806	278	622

Commenting upon these results the report says :—

"The figures show that weight for weight, Loose Box manure is very much more valuable than either manure daily collected and preserved in a covered pit, or manure left in a heap exposed to the weather. But owing to the greater weight produced by the latter methods, the difference in value is very small, being slightly in favour of the Loose Box method of housing cattle. These results, however, cannot be taken as generally applicable. These figures are obtained in a dry district where bedding is scarce and in places like the West Coast, and presumably elsewhere where leaves, &c., are available for bedding, more manure can be obtained per pair of cattle by this Loose Box method of housing, and analysis of Loose Box manure where green leaves have been used as bedding has shown that it is of practically the same quality as that obtained with this method at Koilpatti."

In the Report on the Coimbatore Agricultural Station some interesting results obtained with Green Manures are dealt with as follows:—

"*Green Manure Experiments*:—These, which are regarded as, at present, the most encouraging line of work, were continued and have given most hopeful results. The season generally was bad, as the hot weather was very dry and rain was not received until towards the end of June. Sun hemp was tried, as noted last year, and the tops were cut for fodder, the butts being allowed to shoot again to provide manure. In spite of the lateness of the rains, it was reckoned that over 3,000 lbs. of leaf per acre were worked into the soil.

"*Sesbania aculeata* yielded very heavy dressings. This plant may be either sown in the standing crop of paddy, or may be sown subsequently at any time, the sooner the better. It is a mucn slower growing and hardier plant than sun hemp, and will last without attention right through the hot weather, giving a very heavy weight of leaf. There are two varieties, the thorny one which is a local variety, and a thornless one the seed of which was obtained from Bengal; the latter, however, does not seem so hardy and the absence of thorns is no very great advantage since the thorns are in any case soft and rot very quickly. *Sesbania aegyptiaca*, another local variety, can be similarly used but gives slightly smaller yields and tends to become more woody. The weights grown were calculated at 13½ tons and 10 tons for *Sesbania aculeata* and *Sesbania aegyptiaca* respectively."

"A third course is to get some crop such as wild indigo (*Tephrosia purpurea*) established so that each year it will come up of itself after harvest and provide green manure for the next paddy crop. Wild indigo has a hard seed coat and possesses normally a very low germinating power. Some of the seeds shed each year, with those left in the ground ungerminated from the previous years, will, if the land is ploughed after paddy harvest while it is yet moist, germinate, probably from the scratching of their coats, and give a fair crop. The plant is, however, one more suited for sandy soils, and attempts to establish it on the clayey lands of the farm have as yet been unsuccessful. Fresh seed has again been sown: in order to accelerate germination, it has been rubbed with sand in the ordinary circular mortar mill."

RUDOLPH D. ANSTEAD, *Planting Expert.*

THE TEA TRADE IN THE U. K.

According to the *Grocer* of July 15, 1911, the clearances of tea for home use continue to be fairly well maintained, taking into account the stiff rates still ruling for the common leaf grades. "The exports from Ceylon to this country have received a check owing to serve drought in Ceylon, the quantity shipped for the first half of 1911 being half a million lbs. below those for the same period of last year. Rains have since fallen in Ceylon; and it is to be hoped that later on in the year the deficiency in supplies will be made good. Unfortunately, the drought in Ceylon has caused injury to the roots of the tea plant on some estates. From India supplies are coming forward more freely, the quantities offered at auction being somewhat larger than last year. The shipments from Northern India to the United Kingdom from April 1st to June 30th exhibit an excess of about 3½ million pounds compared with the same period of the previous year. The weather has been favourable for manufacture, and it is much to be desired that the conditions for a substantial output will hold good, as the high prices ruling for some time for the lower grades have been of the most unremunerative character as far as distributors are concerned. Quality has been largely sacrificed to the question of price through the scarcity and dearness of common tea.

Notes and Comments by the Scientific Officer.

126. *Eelworms.*—From time to time specimens of Tea seedlings which have been attacked by eelworms in the nursery are sent to me. The damage is done by *Heterodera radicicola*, which apparently confines its attacks to seedlings and very young plants. In nurseries it may do a great deal of harm, especially if the land has been used several times. Dr. Barber, the Government Botanist stationed at Coimbatore, published a pamphlet on the subject in 1905 and suggested various remedies, and in connection with this it is of interest to note that Mr. J. Smith, County Council Lecturer and Instructor in Horticulture, Durham, in the *Gardeners' Chronicle* of 8th July, advises a top dressing of Rape meal as a remedy for eelworms. This, " acts as an exterminator of eelworms and a fertiliser of the soil at the same time," and it has been found very effective in the case of Begonias attacked by this pest. Rape is grown in India, and Rape seed meal should be easily obtained, and this remedy is adaptable for nurseries which may be suffering from the disease. Pepper is also attacked by eelworms, and Mr. McRae, the Government Mycologist, when lecturing on the Pepper Vine disease in the Wynaad in 1909 said, " Dr. Butler was most probably right in attributing a minor part to the eelworms whose tubercule-like swellings are commonly found on the roots of the vines. They are probably not necessary forerunners of the disease, though it is possible that they sometimes wound and weaken the vines so much that the fungus has a more favourable field for its operations." The galls produced by eelworms on roots are often mistaken by careless observers for those produced on the roots of leguminous plants by the nitrogen-collecting bacteria, and from time to time lead to the suggestion that other plants besides those belonging to the natural order *Leguminosae* are able to live in symbiosis with Nitrogen collecting bacteria.

127. *Adventitious Roots of Maize*:—In my Paper on Roots (*P.C.*, Vol. VI., p. 411) it was pointed out that some plants develop secondary roots from the base of the stem called *adventitious roots*. Maize, or Indian Corn, develops roots of this sort and the habit bears an important relation to its methods of cultivation as is incidentally shown by Mr. Leather, the Imperial Agricultural Chemist, in the second part of his report on the 'Water Requirements of Crops in India' which has been published as a Memoir of the Department of Agriculture in India (Vol. I, No. 10). Mr. Leather says :—

" One of the most striking difficulties which we met with was related to the secondary root system of maize. The cereals, millets, etc., after producing the radicle and one or two leaves, develop the secondary 'adventitious' root system from the node at the base of the first leaf. Shortly after this, the radicle stem below the first node ceases to functionate and dies off, and the plant depends on its secondary root system. It follows that if the surface soil, into which this secondary root penetrates, is moist, the further growth of the plant is assured ; if, on the otherhand, the surface soil is air-dry, this secondary root system cannot develop, or at least may not get down to the moist soil, before the primary stem has died off ; the plant then withers. Now the rate at which the moisture moves through the Black Cotton soil and the Shillong soil is apparently so slow that, although there was a fairly liberal allowance of water, 30% and 25% respectively, in these soils *as a whole* in the first and second seasons, they became air-dry *at the surface* for about 3" deep, and the maize plants could not get their secondary roots through this dry soil before the lower part of the stem began to fail. In the monsoon of 1908 some of the maize had to be re-sown on this account, and all plants in the three soils from Akola, Shillong, and Palur, respectively, had to be assisted."

RUDOLPH D. ANSTEAD, *Planting Expert.*

INDIAN TEA ASSOCIATION, CALCUTTA.

Extracts from Report of Proceedings of a Special Meeting of the General Committee, held at Calcutta, on July 21st, 1911.

The meeting was called to enable Dr. Hope to explain to the Committee and to the representatives of the districts, the present position of the department, and to report briefly upon the work during the past half-year. He read to the meeting the following memorandum, namely :—

A pamphlet on the firing of tea is about to be published. This contains the results of Mr. Carpenter's and my own recent work on the subject and in it we quote also from a recent Dutch publication entitled *The influence of drying on the quality of tea.* Our own conclusions with regard to the conditions under which firing should be conducted are largely borne out by those arrived at in this paper and they both emphasise the importance of thin spreading and low temperature firing at least during the earlier stages of the drying of the leaf. The Dutch paper in question contains some interesting suggestions also as to the point to which the drying of leaf should be carried.

I have recently translated also a Dutch article on the fermentation of tea. The ideas which it contains are entirely revolutionary. It is claimed that micro-organisms in the nature of a yeast play an important part in bringing about the fermentation of tea. Fermentation of tea is a process, the full details of which are not yet known, but which experiments have indicated to be an oxidation. At the moment it is generally accepted that soluble ferments, belonging to the group of oxidising ferments, favour this oxidation. Some facts, however, render it not impossible that micro-organisms also to an extent which is at present unknown, play a part in this process. It is possible that although soluble ferments exert an action on certain constituents of the leaf, micro-organisms may act on others and it is particularly suggested that they may play a part in the development of aroma.

It is the presence side by side of oxidising ferments and of micro-organisms which makes the matter complicated ; for it is very difficult to determine by experiment whether chemical changes which take place are the result of the action of one or the other.

Dr. Bernard has succeeded in isolating from among the micro-organisms which infest the tea-leaf, a yeast-like organism which is always found on the leaf in the garden and which develops during the different processes of tea manufacture. This yeast-like organism appears to occur regularly in gardens under the most different conditions and Dr. Bernard has shown that in no case does it exert an unfavourable action on fermenting tea. This is not so with another group of micro-organisms, the bacteria, which act detrimentally whenever they can develop to any extent on tea. They communicate then a bad odour to the leaf and make it sticky, both characteristic signs of the action of these bacteria.

As regards practical application of the above it appears that fermentation must be stopped before the leaf becomes sticky, that is before bacteria have had time to exert a harmful influence on the leaf.

Secondly, as far as the bacteria are concerned, the work in the factory cannot be carried out too aseptically, although on the other hand everything should be done to increase the number of cells of the yeast-like organism, a result which can perhaps be attained when further investigations have been made, by the use of pure cultures of the organism. In this investigation of Dr. Bernard's results in the use of pure cultures, too optimistic an expectation of the effects which they are likely to produce should not

be held. Accelerated and thus cleaner fermentation will take place, but it is unlikely that the intrinsic quality of the teas of any one garden or district will be greatly improved.

2. The study of green crops is being continued and data collected with regard to the suitability of different species of leguminous plants to the different soils and climates of the tea-districts.

3. Close attention is being paid to manurial experiments and operations carried on by managers of gardens. Two facts which have recently come under our observation are noteworthy. Firstly, that the value of oil-cake diminishes in some cases when applied year after year on the same piece of land, and secondly, that lime is of greater value than has generally been supposed. This suggests that there may be frequent cases of soil becoming acid. This question is therefore under investigation. If this proves to be the case application of organic nitrogenous manures should be alternated by dressings of lime or of some form of manure containing an excess of this constituent.

4. The work of the entomologist has recently been directed towards (*a*) the study of the life-history of the tea seed bug, *Pœcilocoris latus*, and (*b*) an investigation of the insects which attack tea-box-woods. It has been established that the tea seed bug is very harmful to tea seed and in all probability gives occasion for the formation in and between the cotyledons of the seed of the fungi so commonly found. It is desirable that these insects which are easily seen and captured should be destroyed.

The investigation of the damage to tea-chest-woods caused by boring insects is in progress and I hope shortly to be able to show the Committee a collection of the insects in question. It is evident that if wood be seasoned and the sheds in saw mills and tea gardens, where tea chest shooks are stored, be properly looked after and cleaned out periodically, damage from this cause will be very much lessened.

Investigations with a view to establishing a method of treating wood so as to render it immune to attack are not yet completed.

5. During the past six months of this year I have toured in the Darjeeling district and in Cachar and Sylhet. Mr. Carpenter has also paid a short visit to the Dooars and different districts of Assam. Mr. Antram has investigated Sandwich Caterpillar in Upper-Assam.

The Chairman also mentioned that the arrangements for the establishment of the new experimental station at Tocklai were in progress. It was proposed to erect two *bungalows* and a laboratory. Orders had been placed with Messrs. Jessop & Co., Ld., for the steel frame-work of these buildings; and the question of their erection and the provision of the necessary brick-work, wood-work, etc., was now under consideration. The London Committee were undertaking the appointment of a new entomologist to take the place of Mr. C. B. Antram, who was leaving the service of the Association in August. They were also endeavouring to engage a mycologist, but had not come to any definite arrangement so far. Both the entomologist and the mycologist would be stationed at Tocklai.

A general discussion ensued in regard to the working of the department, and with reference to the new experimental station. Mr. Bald made enquiries as to *thrips* and *blister blight*, asking what steps Dr. Hope contemplated taking with reference to these. Dr. Hope replied that he feared the investigation of these pests would have to be postponed until the arrival of the new officer. It would be impossible for Mr. Antram to do any useful work upon *thrips* in the limited time now at his disposal.

INDIAN TEA CESS COMMITTEE.

EXTRACTS FROM THE EIGHTH ANNUAL REPORT,

Being that for the year ended 31st March 1911.

The following is the Eighth Annual Report of the Indian Tea Cess Committee. The Cess was imposed by Act IX of 1903 for a period of five years, and it came into operation on the 1st April 1903. It consequently came to an end on the 31st March 1908. On the 31st December 1907, the Government of India notified that it would be continued for a further period of five years beginning on the 1st April 1908, and ending on the 31st March 1913:—

INDIAN TEA IN EUROPE.

At their meeting on the 26th January 1910, the Cess Committee resolved to continue their advertising propaganda on the Continent; and they allotted a sum of £7,000 for this purpose. The work is under the general direction of the Committee of the Indian Tea Association (London); and Mr. J. E. M. Harington is the Commissioner. As was mentioned in the last annual report, the work is restricted almost entirely to Belgium and Germany. The quantity of tea consumed in these countries is small, but the Committee believe they are justified in claiming that satisfactory progress has been made during the year. In Belgium the results have been encouraging. At Antwerp the depôt for the sale of tea, and the tea rooms in the Marché aux Souliers have had a successful year. A tea room is also being maintained at the Antwerp docks. At the Brussels Exhibition of 1910 Mr. Harington arranged a successful display of Indian tea; and he has also subsidised a tea room in Brussels. Similar arrangements as regards a tea room have been made at Ostend. The work in Germany has been going steadily forward throughout the year. Mr. Harington has removed his headquarters from Antwerp to Hamburg, where he has an office in the Ferdinandstrasse. The tea rooms at Hamburg have been entirely successful. They were visited during the year by 106,627 persons, being an increase of upwards of 46,000 over the preceding year. They are now managed by private enterprise, the Cess Committee being responsible for an annual advertising subsidy only. Two tea rooms were opened in Berlin in 1908, one in the Leipziger Strasse—a leading Berlin thoroughfare—and the other at Charlottenburg. During the past year both these rooms have been closed, it being felt that the purpose for which they were intended had been served. In their place a new tea room has been opened in the Friedrichstrasse. This is an attractive room in one of the most fashionable quarters of the city, and its prospects are distinctly encouraging. It has been opened and is being managed by private enterprise, the Cess Commitee paying a subsidy annually to the proprietor. In addition to the tea rooms, Mr. Harington continues his general propaganda, which has been described in previous annual reports, and his own reports. It includes newspaper advertising, tea demonstrations, displays at exhibitions, and numerous other methods of bringing Indian tea before the public. During the past year, displays have been arranged at various minor exhibitions in addition to the larger representation at the Brussels International Exhibition to which reference has been made. Indian tea is also being adequately represented at the Turin, Dresden and Charleroi Exhibitions during the current year.

The official statistics of tea imports into Belgium and Germany for the year 1910 are not yet available. But the imports are of course small as compared with established tea drinking countries. During 1909 about 1½ million lbs. of tea of all kinds were imported into Belgium; for the same year, the imports into Germany were 10,914,600 lbs. This was, however,

an abnormally high figure. as the duty was increased to $5\frac{1}{2}$d. per lb. on 1st August 1909. The average imports of all teas for the three preceding years aggregated about $8\frac{1}{2}$ millions lbs. The imports of Indian tea for home consumption in Germany average about $1\frac{1}{4}$ million lbs. yearly. Mr. Harington estimates that, of the German population of 65 millions, not more than 20 millions take tea. If this be so, it is clear that Germany would import tea on a large scale if tea-drinking could be popularised.

At the half-yearly meeting of the Cess Committee held on the 17th February 1911, a sum of £5,000 was allotted for the work in Europe during the year which will end on the 31st March 1912.

INDIAN TEA IN AMERICA.

At their meeting on the 26th January 1910, the Cess Committee unanimously adopted the following resolution, *viz*:—

"That a sum of £10,000 be expended on advertising Indian Tea in the United States during the year 1910-11."

This resolution was in continuation of that adopted at the meeting on the 29th January 1909, when a similar sum was voted for the year which ended on the 31st March 1910. Mr. Richard Blechynden continues to act as the Committee's Agent, and the work which he is doing is admittedly satisfactory. A detailed description of it is not necessary in this place as his quarterly and annual reports indicate clearly and fully the nature and extent of his efforts. It will suffice to say here that his campaign is confined to what is known as the Middle West, with head-quarters at St. Louis, Mo. The territory covered includes Kansas, Arkansas, Indiana, Oklahoma, part of Iowa, certain towns in Illinois, and most of the important centres in Kentucky, Tennessee, Georgia and Alabama. The methods of work comprise newspaper advertising on a large scale, the despatch of pictorial postcards and samples, and personal calls on grocers by travellers known as "specialty men." Pictorial advertisement postcards are also sent from Calcutta to grocers' customers and the name and address of the grocer are stamped on each card.

It is interesting to observe that the shipments of Indian tea to the United States and Canada for the year 1910 aggregated 23,848,336 lbs. The shipments of Ceylon Tea were 25,972,197, making a total of 49,820,533 lbs. Of the Indian tea 15,422,900 lbs. went to Canada and 8,425,436 lbs. to the United States. Of the Ceylon tea 13,912,312 lbs. went to Canada and 12,059,885 lbs. to the United States. The total quantity of British grown tea imported into the United States during the year amounted, therefore, to 20,485,321 lbs.

At the half-yearly meeting ot the Cess Committee held on the 17th February 1911 a sum of £10 000 was allotted for expenditure in the United States during the year which will end on the 31st March 1912.

INDIAN TEA IN THE UNITED KINGDOM.

The advertising operations in the United Kingdom have been continued during the year under the direction of Mr. A. E. Duchesne, who is subject to the control of the Indian Tea Association, (London.) At the half-yearly meeting of the Cess Committee, held on the 26th January 1911, a sum of £4,000 was allocated for this work. The methods followed continue to be on the lines defined in the last annual report. The scheme aims at comprising the principal industrial and inland towns of England, together with the suburbs of London, and during the summer months certain seaside resorts. Its main features are lectures by Mr. Duchesne, advertising in newspapers and magazines, distribution of pictorial postcards, pamphlets,

folders, and other advertising matter, and personal calls on dealers, grocers, and others interested in the tea trade.

The Festival of Empire Exhibition at the Crystal Palace has afforded an opportunity for a display of Indian tea, and satisfactory arrangements have been made. A tea kiosk, which is being managed by Messrs. J. Lyons and Co., Ltd., the well known caterers, has been opened. Another building in which pictures of tea estates and tea manufacture and machinery, together with transparencies, etc,, are being displayed has been secured. And samples of tea competing for awards are also being shown. Indian tea is served at Messrs. Lyons and Co.'s refreshment rooms; and suitable advertising matter is being widely distributed among the visitors.

At the half-yearly meeting on the 17th February 1911, the Cess Committee allotted a further sum of £4,000 for expenditure in the United Kingdom during the year which will end on the 31st March 1912.

INDIAN TEA IN INDIA.

To devise satisfactory measures for pushing the sale and increasing the consumption of tea in India is undoubtedly the most difficult branch of the work of the Cess Committee. It is the general opinion that tea is being gradually popularised, but no accurate figures of consumption are available. The only statistical information which can be obtained is that published in the note by the Director-General of Commercial Intelligence, on the production of tea in India. The balance of production over the net exports is the quantity remaining in the country. But as the figures of production are not reliable, this total cannot be accepted as trustworthy. In the circumstances, it is not easy to come to any conclusion as to whether such efforts at advertising tea as have been made from time to time, have been successful or otherwise. But the Committee continue to take advantage of exhibitions and similar opportunities for displaying Indian tea. At the recent United Provinces Exhibition they had a well arranged representation under the control of Messrs. Lipton, Ltd. The net cost of this amounted to about Rs.19,368-14-5, of which Rs.13,000 were paid by the Committee. As many as 27,529 cups of tea were either sold or given away, and 125,000 handbills and pamphlets were also distributed. Pictures, tea garden implements, tea plants, etc., were exhibited, and great interest was displayed in them.

The scheme for distributing compressed tea in India, which was referred to in the last report, has now taken practical shape. At their meeting on the 20th January 1910 the Cess Committee allotted a sum of £2,000 as a bonus on the manufacture and sale of this class of tea. This amount they re-allotted at their meeting on the 17th February 1911. It represents a bonus at the rate of 9 pies per lb. on one million pounds of tea. Messrs, Lipton, Ltd. have at length succeeded in obtaining a machine which compresses tea satisfactorily, and they have quite recently begun work. It is too early at present to anticipate the result of their efforts.

The value of the rubber exported from Bolivia is given in the official returns as rather less than half of the tin exports. Since the price of the former has dropped from the high figures obtained in the first half of 1910, and that of the latter has substantially increased, the net result to the Government in the export tax on these two principal products will continue to show an increase. The United Kingdom takes the bulk of Bolivian exports in the shape of tin and rubber, but they are consigned to Liverpool, Swansea and London more because of the free selling price maintained there than for actual destination to factories, though doubtless an appreciable amount finds its way to British works after sale.

CORRESPONDENCE.

Bulk Manuring.

Dear Sir,—One often hears the following remark in reference to the manuring with bulk, *viz*: "That the organic matter is so big and the amount of Nitrogen, Potash, and Phosphoric Acid so small, that a lot of useless labour is expended in applying same, owing to the latter only being available as food for the plant, and that this might be more easily and cheaply obtained by some of the Artificial manures being applied." I should like to hear a Scientific opinion on the subject as to whether this so-called useless organic matter may not be the substance that contains the bacterial organisms which are necessary for the Nitrification of the soil. I have noticed a piece of coffee (which for several years did well) suddenly go back even though it was having the same treatment with artificial manures on which it had been doing so well. An application of soil from a piece of abandoned land adjoining, which was so inferior that coffee refused to grow on it, was then put to the coffee, thinking that it might alter the mechanical condition of the land, as the stuff could have very little real manurial value, anyhow it had a wonderful effect on bringing the coffee back to its old looks, especially on the resumption of artificial fertilizers.

I have also noticed several other instances with Cattle manure, jungle soil, Line sweepings, etc., in none of which from an analytical point of view is there much of plant food. This has set me wondering as to whether a soil after several years, especially when the crop grown is always the same, does not lose some of the bacteria which are necessary for helping the plant to absorb its Nitrogen, and that the reason these bulk manures sometimes have such a marked effect, is that their so-called useless organic matter contains the organisms for Nitrification of the soil and thus, when one applies it, one renews these and at the same time enables the plants to get the benefit of any nitrogenous manures applied afterwards.

Yours faithfully,

(Signed) E. W. RUTHERFORD.

MEMORANDUM BY THE SCIENTIFIC OFFICER.

The article reproduced in the *Planters' Chronicle*, Vol. VI, p. 338, from the *Agricultural Journal of India* for April by Mr. C. M. Hutchinson, B. A., the Imperial Agricultural Bacteriologist, on the 'Influence of Bacteria upon Soil Fertility' practically answers the above enquiry, and this should be carefully read by all interested in the matter.

The bacteria in the soil are interdependent upon one another. One kind break up the organic matter, or humus, and disintegrate it, making it easy to be attacked by another kind which convert the Nitrogen in it into Ammonium Salts, and the Ammonium Salts are then acted upon by a third kind of bacteria and converted into plant food in the form of nitrates.

Thus humus content and fertility go more or less hand in hand, and the addition of organic matter to a soil increases the number and the activity of the bacteria, not because they are actually added in the humus, but because the presence of this humus up to a certain optimum amount, which it has not yet been possible to measure accurately, provides the most favourable conditions for their growth, and multiplication. This explains why it is that fertilisers like Cattle Manure, though they contain very little actual plant food as such, produce such a wonderfully good effect. Tilth also plays a part since free access of air and water are necessary to the growth of many of these bacteria.

R. D. A.

SOILS AND FERTILISERS.

Leaflet No. XIV of 1911 of the Agricultural Department, Madras.

THE PRESERVATION OF FARM-YARD MANURE.

Most of the soils of South India are deficient in organic matter and, if the fertility of these soils is to be properly maintained, it becomes necessary to supply this ingredient periodically in addition to the usual plant foods. The manures most suited for this purpose are those classed as "bulky organic manures" and of these Farm-yard manure stands pre-eminent and its use can be confidently recommended wherever it is available.

Farm-yard manure may be used in the fresh state, *i. e.*, as voided by the cattle, but this course is not practicable when the land is under crops and, in addition, it is advisable to use manure which has been stored for some time as, by this storage, not only is a more uniform manure obtained, but the plant foods contained in the dung are brought into a state to be easily assimilated by the crop. During the period of storage many changes take place in the composition of the manure, brought about by bacteria and other low forms of vegetable life, which bring the manurial ingredients into a soluble form. These changes, although making the manure more valuable to the cultivator, are always accompanied by more or less loss of the manurial ingredients and consequently the system of storage which reduces these losses to a minimum is, from this point of view, the one to be adopted.

The main losses which occur during the storage of Farm-yard manure are due (1) to the liquid portion draining away and carrying with it the soluble constituents, (2) to loss of nitrogen in the form of easily vapourized substances and all systems of storage to be economically sound must be based upon principles which tend to counteract these losses without at the same time unduly interfering with the course of the fermentation of the manure.

Whatever the system finally adopted, it is of the utmost importance to prevent the urine draining away, as this constituent of Farm-yard manure contains a very large proportion of manurial ingredients. This can be overcome to a large extent by the use of a suitable litter material which will absorb the urine and so prevent its loss by drainage. The best litter and one which is generally available is the waste fodder of the animals, but leaves, weeds and the ordinary waste of a farm answer well and if these be not available recourse may be had to ordinary soil. The necessity for using ample and suitable litter being apparent for all systems the different methods of storage may now be briefly reviewed.

The chief methods adopted for the storage of manure may be designated as the Box, Pit and Heap systems and this classification covers in a broad sense all the methods generally adopted. In the Box system, the animals are placed in a loose box, with a thick bed of litter to which the waste fodder is added daily. The dung of the animals is trampled into and intimately mixed with the litter, which also absorbs the urine. In course of time the whole is trampled into a compacted mass, and by thus excluding excess of air, the fermentation is kept within bounds. In the Pit system the animals are placed on a hard floor and the dung, urine and waste litter is daily thrown into a pit dug in the soil of the yard and made as water-tight as possible. Dry earth is sometimes thrown on at intervals in order to absorb excess of liquid, and often in very dry weather water is added so as to keep the mass at the requisite degree of moisture. In the Heap system the animals stand on a hard floor and the dung and litter are daily

collected and thrown on a heap in the open. Sometimes in this case earth is also added.

These three systems were under trial on the Government Farm at Bellary for many years, and the average results obtained may be taken with confidence. These are given *in extenso* in the following table :—

System.	Weight of manure produced by a pair of cattle per annum.	Lbs. of nitrogen contained.	Lbs. of potash contained.	Lbs. of phosphoric acid contained.	Approximate manurial value in rupees.	Lbs. of organic matter present.
Box	10,140	90·7	155·3	56·2	69·4	3,020
Pit	9,830	55·5	70·0	46·3	37·0	1,765
Heap	6,070	60·0	59·8	44·5	46·0	2,168

This table shows clearly that, from the same number of cattle, for the same length of time, and under the same conditions, the manure given by the Box system is much greater in amount and contains a greater proportion of all the manurial ingredients, and the value of the manure produced far exceeds that of the others. Compared with the Pit system, the Heap system has given somewhat better results, but this only occurs when the heap is carefully protected from heavy rains and from strong winds. If these precautions are not taken, then the losses caused by the rain washing out the soluble ingredients and the wind removing solid particles can become very serious and considerable loss to the cultivator ensue. Further if the heap is allowed to become too dry, the heat produced by the decomposition may become so great as to cause the destruction of part of the manure.

In the case of the Pit system, the great source of loss is due to the liquid portion of the manure draining away and the use of too small amount of litter. These defects can readily be remedied and when this is done, the Pit system compares very favourably with the Heap method, especially under the usual careless local customs. Wherever the Box system cannot be carried out, choice must be made between the Heap and the Pit systems and this choice must be mainly governed by local conditions.

(Signed) W. H. HARRISON,
Agricultural Chemist.

The Government of Madras have authorized Mr. William Everette Bownass, Chundale Estate, Vayitri, to witness the execution of labour contracts under the Madras Planters' Labour Act, 1903.

According to a report by the Italian Commercial Attaché in Mexico, published in the *Bollettino di Notizie Commerciale* (Rome) of 13th April, the cultivation of rubber in Mexico is gradually assuming large proportions in all the States situated in the warm zone, and it is computed that, within five years, Mexico will be a formidable competitor of other rubber growing countries. The rapidly increasing employment of rubber for industrial purposes is causing Mexican farmers to turn their attention to its cultivation.

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THE U. P. A. S. I.

(INCORPORATED.)

The Chairman.

The Hon'ble Mr. J. G. Hamilton arrived in Bangalore on Tuesday night, and has been busy at the office with preparations for the Annual Meeting and the U.P.A. Exhibition.

The International Rubber Exhibition.

To his official report on the above Exhibition Mr. J. A. Richardson has now added notes on some of the machinery that was displayed and worked. His remarks are intended solely for the information of planters, and are of a confidential character. Planters who are desirous of having copies solely for their private use, are requested to communicate with the Secretary, U.P.A.S.I., who will endeavour to meet their requirements and will make a small charge of 4 annas per copy to cover cost of typewriting (or printing), postages, &c. Possibly, orders will not be attended to until after the close of the Annual Meeting, but there will be no avoidable delay.

A number of copies of the U.P.A. booklet issued in connection with the above Exhibition have now been received, and are for sale at Re.1 each.

The copies of the Official Guide of which Mr. Richardson advised despatch have not yet come to hand.

The U. P. A. Exhibition.

It is gratifying to note that Messrs. Parry & Co., Peirce, Leslie & Co., Ltd., and Matheson & Co., Ltd. are among the exhibitors. (The first two firms are also to be represented at the Annual Meeting). Exhibits of Rubber, Coffee, Cardamoms and Pepper are decidedly more plentiful than they were last year, and the display generally will be more varied.

Bound Volumes.

Volume V/1 (first half of 1911) is now available, with a comprehensive index, at a charge of Rs.2 per copy per V.P.P. The index can be supplied separately at 6 annas per copy.

Should any planter have ordered the above volume and not received it he is requested to be good enough to communicate with the Secretary. In the rush of preparations for the Annual Meeting it is probable that some orders may have been temporarily overlooked, especially in cases where standing instructions that all future volumes should be sent were received a long time ago.

Scientific Officer's Papers.

LXXVI.—The Conference at the International Rubber Exhibition.

The full text of the papers read at the Conference held in connection with the International Rubber Exhibition, and the discussions on them, will not be available for some time, but the last few numbers of the *India-Rubber Journal* which have been received contain abstracts of the papers which have been read at the Conference and the extracts quoted below are taken from that Journal.

Dr. Tromp de Haas dealt with 'Tapping Experiments in India,' and Mr. Petch took a prominent part in the discussion on this subject.

" In the course of his paper, the lecturer said the experiments were conducted on trees planted in 1904-5, and all the trees tapped had a minimum circumference of 18 inches, 3 feet above the soil. The different systems adopted were :—(1), two quarter sections opposite each other tapped on alternate days; (2), one quarter section tapped every day; (3), two V cuts on a third of a tree tapped alternate days; (4), one V cut on the third of a tree tapped every day; (5), one single cut on a third of the tree tapped each day; (6), two cuts on a quarter of the tree tapped alternate days; (7), one cut on a quarter of the tree tapped every day. The results were based on one square metre of tapping surface, and showed that the largest quantity of rubber was collected from those trees which were tapped every day. He thought, however, the experiment should be conducted over a longer time before any decisive result could be obtained.

" Mr. Petch said the results obtained by Dr. Tromp de Haas practically agreed with the results obtained from Messrs. Wright's and Bamber's experiments. The only point that occurred to him was that if they were tapped on a four years' system they should complete the whole of the bark in two years by everyday tapping, whereas by tapping alternate days the bark would last the whole period. It depended upon how long it took them to complete one cycle of the tapping and whether they got a long resting period at the end from the everyday tapping. It should be determined whether it was more advantageous to make two cuts on the stem in one day or one cut.

" Mr. Richardson asked whether it would be detrimental to go in for everyday tapping in a district where it was necessary to rest the trees for three months in a year.

" Mr. Petch said he did not think so. The difficulty was that in some districts they tapped every day every year and gave the trees no rest at all."

Mr. H. A. Wickham read a paper on 'Pará Trees in the East' in which he dealt with close planting and clean weeding, describing the latter as 'clean scraping' which was harmful. Hear! Hear! Mr. Wickham. He said :—

" Hevea had been planted far too closely together in the past for a forest tree of its growth and habit. The full growth of the tree must be affected by the close planting. One of the principal reasons for systematic planting was to do away with, or at least minimise, the struggle for existence. Another objection to close planting was that it permitted the more easy spread of disease. The trees had not sufficient room in which to grow, consequently their natural powers of resistance to disease were impaired, and until this was corrected, and their energies restored, they were more liable to succumb to the attacks of the various pests of fungi. The second point he wished to bring forward was with reference to clean weeding, which he was inclined to call clean scraping. In this method the surface after being

burned was exposed to the bake of the sun and the beat of the rain, and any amount of it could be seen being carried bodily away by the drains into the various watercourses. This was a loss which could never be replaced. The root systems of the trees so exposed must suffer. Hevea trees liked to have their heads in the sun and roots under shade covered with soil.

"Mr. Kelway Bamber agreed that it would be better to plant the trees wider apart, but they had to consider the matter from a financial point of view, and looked at in that light it had up to the present been better to plant them closely. He was strongly in favour of preserving the soil, and with that object in view he was growing green crops below the trees and keeping them under control.

"Mr. Fox thought the original idea of planting trees close was that they might be tapped as early as possible and as heavily as possible, in order to provide some return on capital, and then thinned out. Some of the newer estates were being planted 20 feet by 20 feet, which he considered a reasonable distance.

"Mr. Wicherley advocated close planting, especially in districts exposed to the full force of the S. W. Monsoons such as they experienced in Ceylon. He thought in such cases 8 feet by 10 feet was not too close. As an instance of close planting he referred to the original plantation made in Ceylon by Mr. Wickham himself. These trees were planted 6 feet by 6 feet and afterwards 8 feet by 8 feet and later 8 feet by 10 feet. There were two trees in that plantation which produced last year 110 pounds dry rubber, and they were 35 years old. They were good for another 110 pounds this year. The average yield from the trees in that particular grove was between 30 and 40 pounds, and he did not think any of them would quarrel with such a yield as that. Looked at from a financial point of view he did not think less than 220 trees per acre could be made to pay. He thought 12 feet by 16 feet was a reasonable distance, and upon hill sides exposed to the winds 10 feet by 10 feet.

"Mr. Wickham said it appeared to him that what was best for the Hevea tree as a tree was also best from the financial and practical standpoint. He did not see the necessity to introduce artificial cultivation under the trees when they already had the jungle there. He himself used the original jungle. As to the planting of trees, he would not advocate one inch under 33 feet, or 40 trees to the acre. What astonished him was that planters never thought for one moment of putting in coconut trees at a less distance. Hevea should certainly not be planted in a wind exposed position. The tree which Mr. Wicherley had referred to was planted at the corner of the grove and had an open space on three sides of it, and that was the reason why it had made better growth than any of the other trees in the grove. He handed round a photograph of this particular tree."

Dr. Lierke presented a paper on the Manuring of Rubber, in which he pointed out that—"rubber trees were first planted in the East in good soil, but during the time of the rubber boom many estates were opened up on which the soil was not so good, and these estates were now showing yearly diminishing yields. Soil might in some instances be so rich as to require no fertilisation, but as the rubber became older the application of artificial manure should be considered. He had not himself any experience of rubber growing, but he thought a true comparison might be drawn from the results of artificial manuring on orchards of fruit trees. Experiments had been started on rubber plantations, but change of managers had caused them to be stopped. On the stand of the Potash Syndicate, however, they had two

trees, one of which had been manured and the other not. The former showed the better growth. On an Estate in Sumatra a tree which had been manured showed a girth of 14 inches as compared with a girth of 9 inches in one that had not been manured. Of course larger experiments would have to be made, and it was necessary for a man on the spot to give advice as to the manure to be applied, as there were so many factors to be considered, such as soil, climate, rainfall, etc. The object of planters should not be to make two rubber trees grow where one previously grew, but to improve both the quantity and the quality of the latex, and thus ensure a greater return per acre for the capital employed.

" Mr. Hamel Smith said the trees would undoubtedly have to be thinned out in the future, and then it would be necessary to have more Potash in the ground, owing to the size to which the trees would have grown.

The merits of plantation as compared with Native Rubber have been much discussed during the past few years, and it is encouraging to find that the excellence of Plantation Rubber was upheld at the Conference. For instance, during the discussion which followed a paper on the Theory of Vulcanization,' Mr. Clayton Beadle, "referring to the amount of acetic acid in plantation rubber, said it had been found by testing that the acetic acid used to procure coagulation of the latex on the estates could be practically all washed out; and also that there was in washed plantation rubber less acidity than was found in fine hard Pará, the acidity of which was due to the absorbtion of acetic acid during the smoking process which it underwent, the acid being contained in the fumes."

Again, Mr. J. Jaques in the course of a paper on 'The Relative value of Various Raw Rubbers' said "the tensile properties of the cultivated were usually equal to, or of a slightly lower order than, indigenous Pará. There were well known to be some pale qualities unquestionably of higher grade than the average hardcured Pará." While some did not soften readily and it was difficult to obtain a good calendered sheet suited to high class work yet, "there were cultivated Heveas more amenable on the mixing rolls than hardcure Pará, which calendered as well, vulcanized more readily, were stronger, and were just as adaptable as the best native rubber. Plantation rubber under the right conditions also got strength from maturity."

During the discussion of a Paper on the "Viscosity of Rubber" by Miss A. Borrowman some interesting figures were given as to the percentage of rubber found in the latex. " Dr. Stevens said he had experimented in Malaya on several samples of latex and had never got higher than 43 to 45 per cent. of rubber. Forty seemed to be about the average figure where no water was put into the cups and where tapping was conservative. Mr. Petch said that in Ceylon they had conducted experiments upon seven groups, each containing ten trees. These were tapped first every day, the second every other day, and so on until every seventh day was reached. He had no actual figures with him but from memory he would say that in no case did they reach 50 per cent., but they did get as high as 46 per cent., while one of the groups gave only 38. If they had every day tapping they first got 25 per cent., and then it oscillated between that figure and 35 per cent. for the following year. If they tapped every second day they got 30 per cent. with an oscillation between that figure and 38; if they tapped every week they got 40 per cent., and it stopped at about that figure. As a result of their experiments they came to the conclusion that the difference in the percentage of rubber in the latex accorded to the interval between the tappings, or, in other words, the more frequently they tapped the trees the weaker was the percentage of rubber in the latex."

RUDOLPH D. ANSTEAD, *Planting Expert.*

Notes and Comments by the Scientific Officer.

128. *Root Rot of Rubber.*—The Brown Root Disease caused by the fungus *Hymenochaete noxia*, attacks both Hevea and Ceará Rubber and produces very well marked symptoms, thus described by Petch in his book on 'The Physiology and Diseases of Hevea Brasiliensis:'

"The roots, especially the tap root, are encrusted by a mass of sand, earth, and small stones, to a thickness of three or four millimetres, and, as a rule, this crust extends up the stem for several inches. This mass is cemented to the root by the mycelium of the fungus, which consists of tawny brown threads, collected here and there into small sheets or nodules. In the early stages the predominating colour is brown, and the name given to the disease then appears more or less approximate, but as it grows older the fungus forms a black, continuous covering over the brown masses of hyphae, and the diseased root then appears chiefly black. In all stages, however, the encrusting mass of stones and earth, intermingled with brown threads, serves to distinguish it.

"If the outer coat is scraped away, the cortex of the root is found to be decayed, and usually coloured brown by the fungus. The wood is soft and friable, and usually yellow, with wedges of brown, decayed, powdery tissue penetrating from the exterior towards the centre. Black lines frequently run irregularly through the wood, and it is sometimes possible to trace a net work of fine brown lines if the root is split longitudinally."

"If a tree which has been killed by this disease is allowed to remain in the soil the fungus mycelium spreads along the roots to the roots of adjacent trees which are in contact with them. In order to demonstrate this, an inoculation experiment was recently conducted on an estate in one of the rubber growing districts, and though this experiment was undertaken to demonstrate to the manager of this particular estate what the disease was and how it spread, and the necessity of removing the dead and dying trees, the results are so conclusive that they may be of general interest.

"Two stumps, one of Hevea and one of Ceará, which had been dug out and found to be covered with the fungus, and to exhibit all the symptoms described above, were replanted so that the Ceará stump just touched a fine thread root of a healthy Ceará tree four feet away, and the Hevea stump just touched a larger root of another healthy Ceará tree five feet away. This was done about eight months ago and the manager now reports that "both Ceará trees are as dead as doornails and show exactly the same symptoms as other Ceará trees that are dying in our clearings. Evidently the disease we have is pure and simple Root Rot. We are whipping it out as fast as we can. I saw last year that this was absolutely necessary."

129. *Green Dressings in Rubber.*—A progress report on the experiments being conducted in Coorg with Green dressings under Ceará Rubber states that, "great improvement has been noticed in the growth of Ceará where *Crotalaria striata* had been thickly planted about three years ago. It is noticeable in the third year of the *Crotalaria* planting and not before. No good effects have been observed from surface mulching of cuttings of *Crotalaria*, but splendid results when cuttings are buried. Not much good has been done with *Indigofera tinctoria, and Tephrosia purpurea* does not grow well here. *Passiflora* when put in areas that are kept clean grows splendidly, almost too well, but it is impatient of any weed or grass."

RUDOLPH D. ANSTEAD,
Planting Expert.

DISTRICT PLANTERS' ASSOCIATIONS.

South Travancore Planters' Association.

The Half-yearly Meeting of above Association was held at the Club, Quilon, on Saturday, 29th July 1911.

PRESENT.—Mr. D. G. Cameron in the Chair. Messrs. J. B. Cook, R. Ross, E. C. Sherman, I. H. Parkinson, H. G. Seymour, H. H. Stephenson, L. M. Young, Chas. Hall, and A. W. Leslie, Honorary Secretary.

By proxy.—Messrs. Sinclair, Branson, and Morrell.

As visitors.—Messrs. Macdonald, H. G. Cameron, T. H. Cameron, Thornton, Clare, Lamb, and Robinson.

The minutes of last meeting having been confirmed, the Chairman proposed, and J. B. Cook seconded: "That it be recorded in the minutes of this meeting the feeling of regret at the illness of our chairman Mr. J. Stewart."

Mr. J. B. Cook was elected as delegate to represent this Association at the U.P.A.S.I. meeting in Bangalore, beginning on 28th August.

Assistant Scientific Officers Scheme.—After some discussion, it was resolved that one assistant to the Scientific Officer be sufficient in the meantime, and that our delegate be authorised to vote accordingly.

Hybridisation of Coffee.—Proposed by Mr. Ross and seconded by Mr. J. B. Cook, and carried:—"That this Association subscribe Rs.50 towards the Experimental Plot at Coonoor on the understanding that other Associations are doing the same and that our delegate be empowered to grant this amount.

Indian Tea Cess Committee.—Proposed by Mr. D. G. Cameron and seconded by Mr. J. B. Cook: "That Mr. J. C. Parker be the representative of the U. P. A. on the Tea Cess Committee and our delegate was instructed to record the S. T. P. A. vote in Mr. Parker's favour."

U. P. A. S. I. and Mysore Exhibitions.—Members present promised to send exhibits, and it was decided that these should be sent to our Honorary Secretary not later than the 20th August.

Planters' Benevolent Fund.—The yearly subscription list was passed round the room, Messrs. Harrisons and Crosfield, Ltd., subscribing Rs.100.

Capture of Elephants.—Read letter dated 10th June 1911 from the Conservator of Forests and resolved that he be asked to press for a further reward, as Rs.200 was totally inadequate.

Arienkow and Tenmalai Bridges.—Resolved that the Executive Engineer be again written to *re* bad state of the 3 small bridges and that these be taken in hand as early as possible.

Labour Difficulties.—Resolved that copy of correspondence and questions therein be sent to the North Mysore P.A. for reply.

Occupation of Forest Bungalows.—Resolved that the Conservator of Forests be written to and asked if the same privileges cannot be granted to Planters for the occupation of Forest Bungalows as they are by the D. P. W. Camp sheds.

Tenmalai Railway Station.—Proposed by Mr. D. G. Cameron and seconded by Mr. H. C. Seymour, that the Traffic Superintendent be written to regarding the serious state of affairs at this station, and the want of sufficient covered accommodation during the past rains has been greatly felt. —Carried.

A vote of thanks to the Chairman closed the meeting.

(Signed) A. W. LESLIE, *Hony. Secretary.*

Wynaad Planters' Association.

Proceedings of a Meeting held at Meppadi Club, August 9th, 1911.

PRESENT.—Messrs. Atzenwiler, G. C. Parker, J. C. Parker, Powell, Vernede, and C. E. Abbott, Honorary Secretary. *Visitor*: Mr. Darken. *Mr. Powell in the Chair.*

1706. *The Proceedings of last Meeting* were confirmed.

1707. *Extradition.*—Read letters to Honorary Secretaries, Nilgiri and Anamalai Associations, with their replies. Also a further letter from Honorary Secretary, Nilgiri Association, and reply from Honorary Secretary, Wynaad Association. Approved.

1708. *Experiment Plots.*—The Honorary Secretary was instructed to inform Mr. Anstead that there are none in Wynaad.

1709. *Roads.*—Read programme of District Board Engineer's tour in South Wynaad: Vayitri August 9th to 12th, Meppadi August 13th to 19th, Kalpetta August 20th.

Read letter from Mr. West, complaining of the state of the Mysore Road between the British Frontier and Maddur. The Honorary Secretary was instructed to address the Chief Engineer, Mysore State.

1710. *Cattle Disease.*—Read letter from Deputy Tahsildar regarding another outbreak of cattle disease. The Honorary Secretary was instructed to write to the Deputy Collector, asking what steps are being taken to stamp out this outbreak, and when the Veterinary Hospital at Kalpetta is likely to be established. A member stated that the carcases of diseased cattle were sold by their owners to his coolies for food. It was agreed that this practice ought to be suppressed.

1711. *Attesting Contracts.*—Mr. Stewart has been appointed.

1712. *Non-Service of Warrants.*—Read a circular from Honorary Secretary which is to be sent to all members in Wynaad. The meeting hoped that this would be attended to in time to allow the delegate to have the figures before leaving for Bangalore.

A vote of thanks to the Chair terminated the proceedings.

(Signed) S. H. POWELL, *Chairman.*

(„) C. E. ABBOTT, *Hony. Secretary.*

It was agreed to hold the next meeting on October 11th.

Malabar Coast Planters' Association.

Proceedings of the Quarterly General Meeting held at the Trichur Club, at 4-30 p.m., Saturday, the 12th August 1911.

PRESENT.—Messrs A. H. Mead (Chairman), H. C. Plowden, W. D. Tait, Richard Norman, Eric Norman, W. E. Forbes and R. de Roos Norman (Honorary Secretary.)

Visitors.—Messrs Walmesley and Fleury.

By Proxy.—Messrs H. B. Kirk, Campbell Hunt, C. H. Browne and Harding Pascoe.

1. The notice calling the meeting was read and recorded.

2. The minutes of the last meeting was taken as read and confirmed.

3. Letters from Mrs. Tipping and Mr. Anstead were recorded with thanks.

4. ACCOUNTS.—Proposed by Mr. Mead and seconded by Mr. R. de Roos Norman, that a report be prepared for submission to the next Quarterly Meeting by Messrs H. C. Plowden and E. H. Hallidy, and in connection with the same that Mr. Plowden be asked to refer the matter of Messrs Wiele and Klein's account for photographs to the Secretary of the U. P. A. S. I., as there appears to be some misunderstanding on the matter.

5. ASSISTANT FOR THE SCIENTIFIC OFFICER.—Read and recorded letters from Messrs Pascoe, Hunt and Browne, and considered in open meeting. Resolved that, as opinions on this point differ, it is not possible for the M. C. P. A., as an Association to promise further support to the scheme, in the meantime, but that our delegate be requested to ascertain further information, and report at the next quaterly meeeting.

6. MEETINGS.—This Association is against, and is not in favour of two meetings being held per annum in Bangalore, and our delegate has been instructed to vote against the same.

7. ROADS.—Recorded Chief Engineer's letter with thanks.

8. SCIENTIFIC COMMITTEE'S REPORT.—Resolved that Mr. Kirk's report be circulated for the information of the members of the Association, and that Mr. Kirk be thanked for the same.

9. Read and recorded with thanks the General Traffic Manager's letter *re* Waiting Room at the Pudukad Railway Station, and that the Honorary Secretary be asked to approach the Durbar again on the matter.

10. READ MR. KIRK'S PROPOSAL.—"That in view of the great inconvenience caused by Estate account books being kept in court for longer than is necessary to makes copies of exhibits contained therein, the Dewan of Travancore be petitioned to issue orders that certified true copies be accepted by the courts from all litigants of recognised status, and that the help of the other Travancore Associations, in this matter, be solicited." Seconded by Mr. Mead and carried unanimously, and resolved that the Honorary Secretary be directed to communicate the above resolution to the Honorary Secretaries of the respective Associations in Travancore; and to petition the Dewan of Travancore thereon.

11. Proposed by Mr. R. de Roos Norman, seconded by Mr. Mead, and carried unanimously, that in view of only one delegate attending the U.P.A.S.I. from this Association, it was resolved that the Delegate's expenses shall be, for this year, Rs.150.

12. U.P.A.S.I. EXHIBITION.—Members desirous of sending exhibits were requested to post them direct to the Secretary, U.P.A.S.I., Bangalore.

13. INDIAN INSTITUTE OF SCIENCE.—Read and recorded with thanks the letter, dated 7th August, from the Secretary of the U.P.A.S.I. Resolved that the Honorary Secretary do convey to Dr. Morris Travers their best thanks for his kind invitation, and that our delegate will have much pleasure in accepting his cordial invitation to visit the above Institute.

14. Proposed by Mr. W. D. Tait and seconded by Mr. R. de Roos Norman, that in view of Mr. Lord being unable to serve on the Committee, Mr. E. F. Barber be asked to serve; and failing him, Mr. Harding Pascoe be asked to fill the vacancy in the executive.

15. DELEGATE TO THE U. P. A. S. I.—The Honorary Secretary was requested to give Mr. Plowden, the delegate, the necessary instructions.

16. RESIGNATION OF CHAIRMAN, U. P. A. S. I.—The Honorary Secretary was instructed to write to the Secretary of the U.P.A.S.I. recording the Association's vote in favour of the Hon. J. G. Hamilton acting as Chairman

at the forthcoming U.P.A.S.I. meeting, and regret that pressure of work prevents Mr. Brock from continuing in office.

17. HYBRIDISATION OF COFFEE.—The meeting was of opinion that the financing of the proposed experimental plot should be left over for discussion at the U. P. A. S. I. meeting, the delegate being instructed to use his discretion in the matter.

18. Resolved that a vote of thanks be conveyed to the Honorary Secretary and committee of Trichur Club for their kindness in allowing the Association to hold their meeting in the Club.

Papers laid on the table :—

U. P. A. S. I. Circulars.

Correspondence.

Account Books.

Rubber in Southern India.

With a vote of thanks to the Chairman, the meeting closed.

(Signed) A. H. MEAD,
Chairman.

(„) R. DE ROOS NORMAN,
Hon. Secretary.

THE TEA BOOM.

HIGHEST QUOTATIONS FOR SEVEN YEARS.

In conversation with Mr. P. J. Parsons, of Messrs. George White, Bartleet & Co., a *Times of Ceylon* representative learnt that the tea prices wired out by Messrs. Geo. White & Co., on August 15th. are the highest quotations given by them during the last seven years ; and this notwithstanding the fact that the figures relate to the first sale after the August Bank holiday, which is usually more or less feebly supported, owing to the offerings consisting of a fortnight's accumulations, and also to the holiday season.

The following were the market quotations for Ceylon tea in London :—

Common Pekoe Souchong, sweet ordinary low-country tea, 8*d.*

Common Pekoe, sweet ordinary low-country tea, 8¼*d.*

Fair Pekoe Souchong, with some flavour, 8½*d.*

Common Broken Pekoe, sweet ordinary low-country tea, 8½*d.*

The market for all kinds is higher.

Mr. Parsons said that the nearest approach to to-day's price for common pekoe souchong in the corresponding sale during the previous seven years was 6½*d.* in 1910, and the lowest quotation was 3½*d.* in 1906 ; and, taking into account the fact that these figures related to the lowest grade, the market fluctuations of which were of necessity much narrower than that of better classes, the difference was remarkable, and served as a very good illustration of the extraordinarily strong position of the tea market to-day.

TEA.

Cultivation and Manipulation of Tea in Java.

In the *Spice Mill* there are some interesting observations of a German writer, Mr. Heinrich Heiland, which were originally contributed to the *N. Y. Staats-Zeitung* and then translated especially for the first-named contemporary. Mr. Heiland's remarks read as follows :—

The tea planter in the English and Dutch East Indies has probably the hardest and most trying life of all Europeans resident in the tropics. He must cover great distances every day up-hill and down-hill and for the most part on foot, the roads being almost invariably too bad for carriages and usually impassable for horses. What does he receive for his product ? The following exhibit is compiled, not according to the quality of the tea, but according to its market value, in which the colour of the tea and, above all, fashion, play an important part.

The most expensive kinds, known as "Orange," owe this name to their colour. They appear as though glittering with golden yellow rods, the 'gold tips,' which are the points of the youngest tea leaves. They have hardly any effect on the flavour, but it makes the tea expensive, at least in England. The first quality is :—

Orange Pekoe, I ...	... 60	to	90	cts.	Dutch.
Orange Pekoe, II ...	... 45	,,	60	,,	,,
Broken Orange Pekoe ...	... 38	,,	55	,,	,,
Pekoe	... 40				,,
Broken Pekoe	... 20	,,	40	,,	,,
Pekoe Souchong ...	... 20	,,	40	,,	,,
Souchong	... 22	,,	30	,,	,,
Broken tea	... 25			,,	,,
Fanning, Broken Orange Pekoe	... 25	,,	50	,,	,,
Tea Dust	... 18			,,	,,
Buey (Chinese, crave, the coarsest tea)...	15			,,	,,

All these different varieties, the names of which are not unknown in Germany, do not originate, as we might imagine, in different countries but every tea plantation, irrespective of the country in which it is located, supplies all the kinds, which are distinguished only by the presence of the tips referred to, by their greater fineness or coarseness, the various kinds being separated by simple screening. These prices, which vary for different plantations within the limits quoted, are understood as applying to tea packed air-tight in lead-lined chests, delivered free in London or elsewhere in Europe, which entails for the grower a further outlay of 6 per cent. per pound. The buyer has to pay the duty, which, however, in most countries is inconsiderable.

Compare with these figures the prices that must be paid in Germany for instance. This, however, is not the chief source of complaint of the planter, rather it is the adulteration of tea, which materially reduces the quantity of the better qualities of tea, the Ceylon and Java teas, for instance, that are consumed. Unlike coffee-bean imitations, tea cannot be adulterated with all sorts of incredible substances, but according to common statements, almost all tea-dealers mix the strong, aromatic teas of Java and Ceylon with low-grade, insipid Chinese kinds, worth only a few cents, and sell this mixture to the public under the pretence that it better answers the popular taste.

It is certain that the buyer who obtains for the first time 'unmixed tea' in place of the 'improved' kind and without knowing uses the same quantity

per cup, will be astonished by its strong flavour. A fraction of the quantity would suffice to produce good, aromatic, drinkable tea.

The cultivation of tea is about the same on all plantations managed by Europeans. The somewhat extensive machinery demanded by every plantation comes almost without exception from England, Germany having thus far overlooked this exceedingly profitable branch of industry.

The most important property of the tea plant and one in which it is superior to the coffee plant, is that the tea produced is better, the older the tea plant is. The Japanese tea planters at Nagoya have tea plants that are several hundred years old. The tea plant is, moreover, exceedingly hardy and can with difficulty be exhausted, whereas the coffee shrub, after 20 to 40 years, is worthless and for the most part dies off without it being possible to raise another crop of coffee on the same land. The soil is absolutely exhausted to a great depth, so that even experiments in fertilization have failed.

For this reason, which is very readily accompanied by a diseased condition in the poorly nourished trees, the coffee tree in Ceylon has almost died out and is rapidly dying out in Java. The successor is the tea plant, which will occupy the land for a much longer period.

Its existence begins in the nurseries—long, narrow beds, protected by a light, semi-permeable roof, of alang-alang (reeds) from the too ardent rays of the sun and from the tropical cloud-bursts. When the little tea plant has attained here a height of about one to one and a half spans, it is transplanted into the fields which are usually located at a pretty good altitude on the sunny mountain slopes.

The small but vigorous plants, soon send out strong roots, regardless of whether the soil consists of tough red loam or stony land, and after one or two years the harvest of the leaves may be commenced.

The gathering is entrusted to native women and children, who pass as frequently as possibly along the endless rows of tea plants, preferably every second or third day, and pick the newly formed leaves, but according to a carefully prescribed system, otherwise the plant would be injured in its growth. In baskets and cloths, the leaves are carried to the tea factory, which is usually at a considerable distance, for which reason narrow-gauge railroads, etc., are extensively used.

Arrived at the factory, each picker separately delivers her tea, which is weighed and credited to her in the wages book. The leaves are then spread to wither on long frames, covered with fabric, a process that leaves them tender and easy to roll. The manipulation of the tea begins next morning. First of all, the leaves, still green, are dumped into the 'roller' a machine consisting of a box open at the bottom and a table made from wood or granite, the central portion of which is equipped with rounded bronze ribs.

As soon as the box is full, the roller begins to turn, but although box and table revolve in the same direction, this takes place in such manner that they continually slip over one another. If the box is farthest to the right, the table is farthest to the left, and thus it continues in a peculiar circular movement until the finest tea leaves are rolled up. The centre of the table then opens, the ball of tea falls out and is dropped into a vigorously vibrating screening machine. Here the balled up mass separates, the fine, closely rolled leaves drop through the screen, while those that are tougher and are not properly rolled remain on it. By this means the best tea has already been separated, which is sometimes further treated separately, sometimes added to other tea.

The larger proportion of the leaves find their way back to the roller but they are now forced downward by means of a heavy block of wood, so that

the rolling is the more forcibly accomplished. This process imparts a brownish to blackish colour to the leaves, owing to their giving off carbonic acid and absorbing oxygen. The rolling being concluded, they are again screened and then transferred to the oxidizing chamber, a partly darkened place, cooled by water trickling over it, and provided on one side, with ventilators.

Here the leaves are spread on sloping glass plates so that they are exposed to a current of air, cooled by passing in through a wetted curtain. The leaves absorb the oxygen, whereas the carbonic acid is removed through ventilators at the opposite end. Very soon the leaves have become almost black and are then quickly dried. For this purpose a variety of different appliances are used, from the simple heated pan, used in China and Japan, to the modern automatic drying machines, weighing about 20,000 kilos. (20 tons).

In these modern contrivances a device that carries the leaves for a distance on an endless belt, distributes them automatically on perforated metal sheets, allowing them subsequently to fall on a second layer of similar moving screens. A third, fourth and fifth series carries the tea to and fro, until the last allows it to fall into a receiver.

Through the hermetically closed space in which the sieves move, a powerful fan draws a current of air, which by means of a complicated firing arrangement, is heated to exactly the right temperature. The tea reaches the receiver thoroughly hard and dry. The assortment of the tea then follows, *i.e.*, its separation into different grades, which is very easily effected by means of totaling screening machines, which are equipped at different points, with rows of knives, by means of which the coarse tea is reduced.

It passes at the same time over screens of increasing mesh, each of which allows a certain grade of tea to drop through. Far certainty's sake, the different kinds are finally passed through hand sieves to ensure absolute uniformity.

This concludes the manufacturing process. The finished tea is stored in an air-tight receiver and when this is filled each kind is carefully mixed up, to ensure perfect unformity, because each day's tea is different.

This thoroughly mixed tea is then packed in boxes of thin wood with a covering of mixed lead and tin. By means of a shaking machine on which they are placed, the tea is closely packed and the boxes perfectly filled, after which the inner lead lining is carefully soldered up. The outer wooden box is nailed up, marked with a stencilled sign showing the kind of tea and then, on an ox-cart, or the railroad, transported to the nearest harbour.

[Regarding Java Tea, *Tropical Life* observed recently:—" Many proprietors who also have rubber plantations hesitate to increase the area under tea in face of the difficulty of maintaining an efficient labour force for both crops. The produce has been, speaking generally, excellent; and the attention given to market requirements, both as regards manufacture and packing, is not surpassed anywhere. A feature of Javanese teas had been the consistent equality of the offerings, which ensures for them a continuance of support throughout the whole year. The majority of the estates have for some years used the finest Assam seed, and with expert cultivation and manufacture are now producing tea which ranks with that from good Indian and Ceylon estates. During the past twelve months the crop gathered has been about 40,500,000 lbs. of which about 32 per cent. has been disposed of on the London Market. Asia and Australia —not London nor Holland—secured the additional 4 millions exported in 1910."]

The Production of Tea in India.

IN THE YEAR 1910.

From the official Note on the Production of Tea in India in the year 1910, prepared in the office of the Director-General of, Commercial Intelligence, India, it appears that the total area in acres was 563,449, as against 555,305 in the year 1909. The following details may be given :—

	1909.	1910.
Eastern Bengal and Assam ...	437,804	442,582
Bengal	53,469	53,530
Northern India	17,442	17,281
Madras	15,723	18,099
Travancore	29,174	30,262
Burma	1,693	1,695
Total ...	555,305	563,449

Of the total area of 563,449 acres for which either returns or complete estimates have been received, 529,032 acres were reported to have been plucked during the year. On the remaining 34,417 acres, the plants were either too young to be plucked or were not plucked for other reasons.

The total number of plantations was 4,402 in 1910, as against 5,890 returned in 1909—a net decrease of 1,488 plantations. The decrease is mainly due to the fact that in Burma, where tea plants are grown scattered in the jungle, the plants owned or plucked by one man were formerly taken to represent one plantation, but in the present return each village containing tea plants has been taken to represent one plantation irrespective of the number of owners or pluckers in that village.

In Eastern Bengal and Assam 944 plantations are reported to have a total area of 442,582 acres under tea, an average of 469 acres. In Bengal 301 acres is the average of 178 plantations, and in Travancore 403 acres of 75 plantations. In Madras and the United Provinces the average is much smaller, being about 140 acres in the former and 109 acres in the latter. In the Punjab, where tea cultivation is conducted on a small scale, the average area is only 3 acres. These figures relate only to tea-bearing areas and do not include the area in the occupation of planters but not under tea cultivation.

The total production in 1910 has been reported at 261,680,950 lbs. divided between the different parts of India as follows :—

	1909.	1910.
Assam	174,851,202	175,095,069
Eastern Bengal ...	47,465,737	48,741,129
Bengal	13,165,788	14,412,287
Northern India ...	3,620,331	3,464,129
Southern India ...	18,679,409	19,968,336
Total ...	257,782,957	261,680,950

Burma is excluded from these calculations for the reason that the produce of the Burma tea gardens is almost wholly converted into *letpet* (wet pickled tea) which is eaten as a condiment. In 1910, 238,755 lbs. of *letpet* were manufactured and only 7,887 lbs. of leaf tea (black).

The production of manufactured tea (green and black) per acre plucked during 1910 works out as follows :—

	lbs.		lbs.
Jalpaiguri ...	582	Chittagong ...	362
Travancore ...	567	Dehra Dun ...	344
Lakhimpur ...	561	Nilgiris ...	323
Cachar ...	552	Darjeeling ...	280
Malabar ...	540	Kamrup ...	228
Darrang ...	539	Chittagong Hill Tracts...	202
Sylhet ...	526	Kangra ...	152
Nowgong ...	499	Almora ...	129
Sibsagar ...	484	Ranchi ...	129
Coimbatore ...	472	Garhwal ...	60
Goalpara ...	367	Hazaribagh ...	31

The average production per acre in the whole of India (excluding Burma) was 465·8 lbs. in 1910 as compared with 469·6 lbs. in 1909.

The Production of Green Tea.

	lbs.
Eastern Bengal and Assam and Bengal ...	1,620,760
Northern India	1,310,048
Southern India	164,480

Green Tea was manufactured for the first time in two gardens in the Sylhet District (Surma Valley).

Exports.

The most striking features of this year's trade are as follows :—Exports by sea increased by 4,979, 550 lbs. as compared with 1909-10. Shipments to the United Kingdom decreased by over 6 million lbs. ; but Russia took 7 million lbs. or some 29·6 per cent. more. Exports to Germany contracted by some 317,000 lbs., while shipments to Austria-Hungary rose by some 20,100 lbs. or 86 per cent. The exports to Denmark, Sweden, Holland, and Belgium also advanced ; but Norway, Italy, France, Roumania, and Turkey-European took smaller quantities. Some 227,000 lbs. more were exported to Egypt, while Canada's takings declined by some 591,000 lbs. The United States took some 100,000 lbs. less. China increased her imports by about 2,056,000 lbs. and Ceylon by 761,000 lbs. The shipments to Australia and New Zealand advanced by 740,400 lbs.

During the five years 1903-04—1907-08 the percentage of the Indian tea crop sent to the United Kingdom steadily diminished. The two succeeding years showed some improvement, but in 1910-11 there was a marked decline. On the other hand, exports to other countries in Europe increased steadily throughout the period and have more than doubled in the last five years. A feature of the year's trade is the considerable advance in shipments to Asiatic countries such as Ceylon, China, Turkey-Asiatic, and the Straits Settlements.

Foreign Tea in India.

The imports of foreign tea into India in 1910-11 were 8·24 million lbs. or about a million and a half pounds more than in 1909-10. About one-tenth was re-exported as foreign tea, chiefly from Bombay to Persia, Turkey in Asia, Muscat, and the Bahrein Islands by sea, and by land to Afghanistan, leaving some 7¾ million lbs. for consumption in India. Part of this no doubt was used for blending with Indian teas, and the blend, when exported, was perhaps treated as Indian produce in the Customs declarations.

Persons Employed in the Indian Tea Industry.

The number of persons employed in the industry in 1910 is returned at 519,863 permanently employed and 80,745 temporarily employed.

RUBBER.

Para v. Plantation Rubber.

The following is a report of a general discussion that took place at one of the meetings at the International Rubber Exhibition Conference:—

Dr. Huber (Pará) said it would be interesting to know the opinion of manufacturers on unsmoked Pará from wild rubber trees.

The Chairman (Dr. Torrey) said in his experience it had not been an uncommon thing for manufacturers to get a quantity of third-grade rubber that was commonly called Sernamby, which they would sometimes rate as high as the best Pará and would use for the same purposes. It was, however, a product that varied greatly, sometimes being extremely good and sometimes extremely bad. He was inclined to think that sometimes scrap which had not been smoked was as good as smoked.

Dr. Huber said two kinds of scrap were exported from Brazil, namely the real scrap from the trays or pans, and that which had coagulated naturally in the tins.

Dr. Esch said his experience in Germany was that the best grades of Sernamby would not give English cut sheet, nor could it be used for goods of the highest order. The elasticity after masticating was very low in comparison with real smoked Pará. It was also his experience that for hard wear rubber goods, such as tyres, they could not use plantation rubbers. In some cases Sernamby was better than Pará.

The Chairman said he knew of at least one large firm of tyre manufacturers who use plantation rubber, and the tyres which they produced had a world-wide reputation of wearing quality. The question of the use of plantation rubber was not a matter to be settled in a minute or to be decided by a single experiment that did not happen to turn out well. He agreed that some kinds of plantation rubber did not resolve so well when milled under the same conditions as Pará, but that was tempered by the fact that it was not uncommon to have two classes of plantation rubber, one of which masticated well and the other did not. It was impossible to tell by observation that a piece of rubber was going to vulcanize.

Dr. Esch said the difficulty with plantation rubber was that they could not get enough of the same kinds. The biggest German rubber works said it was impossible to get English cut sheet from plantation rubber and that was a most important test. If a rubber would give English cut sheet, it was a rubber of fine quality. There were plantation rubbers which stood high mastication, but manufacturers feared there would not be enough of this kind. If they bought ten tons which satified them it was a difficult thing for them to get ten tons more of the same grade. At the same time they would be very glad to have plantation rubber increased to a standard so as to be throughly reliable.

Dr. Torrey said it depended a great deal on the methods of the factory. No one was more in favour of plantation rubber than he was, and manufacturers had been able to get along with all grades of rubber of varying quality notwithstanding all that was said about the necessity for uniformity in plantation rubber.

Mr. F. Crosbie Roles (Ceylon) gave it as his opinion that the difference in the quality of plantation rubber was due to the fact that, in the first instance, they were tapping old trees, whereas now young trees were being tapped and the latex from them was not so good as in the case of older trees.

Dr. Huber said he gathered that the superiority of the wild Pará over plantation was admitted, and that the uniformity of the former was due to the method of preparation. It seemed to be the opinion of chemists and manufacturers that the superiority of the wild Pará was not in the composition of the latex, but in the method of preparation and the uniformity of the product. That was of great importance to Brazilians.

Mr. Sutter thought there was a considerable difference of opinion as to whether the superiority of Pará over plantation rubber existed. In fact, owing to the extent of most plantations, there was an insufficient quantity coming from particular estates, but this would be altered later. One manufacturer preferred one kind, and another preferred some other kind. Manufacturers had given no reasons for the changes they had made, and the planter could not tell what to aim at, so he simply pleased himself in the matter, suiting his own convenience; it was a young industry at present, and things would right themselves later on.

The Chairman said if manufacturers told planters what kind of rubber they wanted and what was wrong with the kinds they did not like, it would involve considerable trouble. Manufacturers did not trouble themselves about the composition of the latex, they did not care about the percentage of protein or resin in the rubber, but what they did trouble themselves about was that they should be able to get a second supply of rubber of any particular grade that suited them. In other words, they wanted uniformity. He suggested that the latex should be bulked and then it would be uniform in quality. This was a course adopted by creameries when dealing with their milk, and it seemed to answer satisfactorily.

Mr. Petch said he gathered from what had been said that plantation rubber was not so good as it used to be, and it was not sufficiently uniform in quality. He agreed that the former was due to the young trees now coming into tapping. Rubber from old trees was better than that from young trees. He could not understand why it was not uniform, as the bulk of the trees now being tapped were of the same age. As to the suggestion that they should bulk their latex the same as the creameries did their milk, they had always understood that the very thing they must *not* do was to mix the latex. If manufacturers desired the latex to be mixed, the planters would be pleased to do it because it would mean a saving of labour.

Dr. Black said his experiments had satisfied him that rubber from young trees was inferior to that from old trees. He did not agree with the chairman as to mixing the latex. The result would be a system of blending similar to that met with in whisky. They often saw a bottle of whisky labelled "Ten years old," but as a result of the blending that had gone on, it contained a percentage only one year old.

Mr. Whalley said there was a considerable difference of opinion as to the exact meaning of the word "uniformity." A planter meant by uniformity that the product of his estate was uniform, but a manufacturer when using the word referred to the uniformity of the quality of the product. Yet again the word might mean that there would not be a greater loss than 10 per cent. in washing. There was some 5,000 rubber manufacturers, and it was impossible to get them to give a standard definition.

Mr. Crosbie Roles said it had been stated in Germany as a result of tests that had been made that the quality of the rubber was not affected by the age of the tree.

Mr. Petch agreed that the statement had been made, but it was not supported by figures.

The discussion then concluded.

The Planters' Chronicle.

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THE U. P. A. S. I.

(INCORPORATED.)

The Annual Meeting.

FIRST DAY—MONDAY, AUGUST 28, 1911.

On Monday morning a Committee meeting was held at the Mayo Hall, Bangalore. Proceedings opened at 11 a.m., and comprised the reading of the Secretary's Annual Report, submission of the audited accounts for the year 1910-11, scrutiny of the Agenda Paper, and preliminary discussions of one or two subjects.

At the suggestion of the Chairman it was decided to appoint a Vice-Chairman for the 1911 meeting, and Mr. C. E. Abbott's name having been proposed the delegates voted unanimously in his favour.

The Committee meeting closed at 1 p.m.

At 3 p.m. the Seventeenth Annual Meeting of the Association was opened. Those present were :—

CHAIRMAN AND PLANTING MEMBER OF COUNCIL—HON'BLE MR. J. G. HAMILTON.

Delegates.

Anamalais ...	...	... MR. E. F. BARBER.
Bababudin ...	...	... MR. A. C. W. DENNE. MR. N. G. B. KIRWAN.
Central Travancore	...	... MR. F. BISSETT.
Coorg ...	...	... MR. W. M. BALL. MR. P. G. TIPPING.
Kanan Devan	...	... MR. A. Ff. MARTIN.
Malabar Coast	...	... MR. H. C. PLOWDEN,
Mundakayam	...	... ———
Nilgiris ...	...	... MR. E. F. BARBER. MR. A. K. W. DOWNING. MR. A. S. DANDISON.
North Mysore	...	... MR. C. DANVERS.
South Mysore	...	... MR. E. M. PLAYFAIR. MR. F. M. HAMILTON.
Shevaroys ...	...	... MR. CHAS. DICKINS.
South Travancore	...	... MR. J. B. COOK.
Wynaad ...	...	... MR. C. E. ABBOTT.

A number of visitors attended, including Mrs. J. G. Hamilton, Mrs. F. M. Hamilton, Mrs. E. F. Barber, Mrs. Reed, Mrs. Anstead, Dr. Morris Travers, F.R.S., Rev. Mr. Redmond, Mr. E. L. Mahon, Mr. Reed, Mr. Bernard (of Messrs. Parry & Co.), Mr. Langley (of Messrs. Peirce, Leslie & Co., Ltd.), Mr. E. W. Fowke, and Mr. H. C. Sherman.

The Chairman opened the proceedings by reading the following extract from a letter he had received from the ex-Chairman (Mr. C. H. Brock) :—

"Just a few lines to send you my best wishes for a successful meeting and I trust, for your sake, that it may not prove a too arduous one.

"I really do hope that some real progress will be made with regard to the Labour Problems and the Scientific Department, but I do feel that progress with the latter, important though it is, is totally insignificant compared to the former. Owing to the unbridled war of rates and advances now in progress we will, very shortly, have increased the cost of production of all products anything from 15 to 25%. Needless to add this is an insane policy when the trend of all commercial undertakings in these days of keen competition is to reduce the cost of production by uniting individual producers or manufacturers in their particular branch of trade so as to be able to stand in the struggle against outside competition. If we would only honestly grapple with the question, and stop wasting our own money in fighting each other over rates and advances, and would spend the money we are now wasting in fighting outside competitors only, then, having secured Labour Peace amongst ourselves, we would be in a better position to improve quality and reduce cost of production by means of Scientific Investigation.

"You may, and probably do, think that I am a 'Labour Fanatic,' but I honestly do not think that I am exaggerating the seriousness of our continual inaction, which is solely due to want of unity.

"I must ask you to be so good as to apologise to the meeting on my behalf for having had to abandon my duty to the Association so suddenly, and to express my disappointment and regret at not being able to be present at your discussions."

The Annual Report, 1910-11.

The Annual Report, which had been read and approved in Committee, was then taken as read and adopted. Its text was as follows :—

In this year's report the first place must be occupied by an expression of sincere sorrow at the death of the late Chairman, Mr. R. D. Tipping, and of heartfelt sympathy with his widow and family. Mr. Tipping had only connected himself comparatively recently with the actual work of this Association, and was elected as its Chairman almost at the outset of that connection. His enthusiasm, his energy and his business ability were manifested for all too short a time in the cause of the planters of South India as a community.

Mrs. Tipping desires that her sincere and heartfelt thanks be conveyed to the members of the U. P. A. S. I. and Council for the kind expression of their sympathy which was duly conveyed to her.

The death has also to be recorded with regret of Mr. H. G. Parsons, formerly a Vice-Chairman of the Association and from its earliest years a staunch coadjutor.

Mr. C. H. Brock, who was elected Vice-Chairman at the annual meeting of 1910, succeeded Mr. R. D. Tipping as occupant of the Chair, but almost as soon as he had taken charge the Directors of the Company whose interests he represents called upon him to resign ; and for the second time in the year a sudden change of Chairman had to be faced.

The gap was filled by the Hon'ble Mr. J. G. Hamilton, who was elected Chairman by the unanimous vote of the Council of the Association, and now gives it his valuable services in the dual capacity of Chairman and Planting Member of the Legislative Council of Fort St. George.

One new District Association—the Bababudin Planters' Association—has been admitted to membership during the year; and it is desirable to note here a change of name in the case of another member, the Cochin and North Travancore Planters' Association being now known as the Malabar Coast Planters' Association.

During the year the registered office of the Association in Madras was transferred to the premises of Messrs. Parry & Co., who were at the same time appointed Agents.

This year a number of visitors have been invited to attend the annual meeting, and delegates have received several invitations of an interesting kind, notably one from the Director of the Indian Institute of Science to visit that institution; and one from Messrs. Scovell's Estate, Ltd., to inspect their fruit farm. They have also been invited by the Mysore Tannery, Ltd., to inspect the works of that Company. The first of these invitations has been accepted already.

Mr. George Romilly having proceeded to England, a vacancy remains to be filled on the Indian Tea Cess Committee, and delegates to the present meeting will be called upon to elect a nominee for appointment by the Government of India to this post.

A portrait of Mr. H. P. Hodgson, ex-Chairman and ex-Planting Member, has been kindly presented to this Association by the Nilgiri Planters' Association; one of Mr. George Romilly, who served the U. P. A. S. I. in the same two capacities, has been provided by this Association; and a third portrait, that of Mr. J. A. Harris, an ex-Chairman of this body, has been presented by the South Mysore Planters' Association.

These portraits will be hung in the office of the U. P. A. S. I., and the unveiling ceremony is to be conducted before the present meeting closes.

As the years pass appropriate additions will no doubt be made to the nucleus of a Picture Gallery that has now been formed.

It may be also mentioned here that, once again, a small Exhibition is to be held in the U. P. A. S. I. premises, commencing on the morning of the 29th August 1911. It will be, like its predecessor, modest and unpretentious; nevertheless it will mark a distinctly progressive step, the exhibits being both more numerous and more varied than those of last year. To all those—planters, business firms, and manufacturers—who have contributed samples to this Exhibition the thanks of the Association are due.

A further large increase of work in the office has to be recorded, notably in connection with (1) the Scientific Department and (2) the International Rubber and Allied Trades Exhibition in London. The Laboratory sanctioned last August was virtually completed before the end of December, and was in work by the beginning of the current year. The cost was Rs.2,514-14-5, against an estimate of Rs.2,500. Water connections and electric light were fitted up in office and laboratory at the cost of the landlord.

Every year now witnesses a larger turnover of money; and one or two additions to the office staff have become a necessity. As, however, a proposal to extend the scope of the Scientific Department will be brought up for full consideration and discussion at this meeting, the adjustment of the office staff to the requirements of the future will be partly dependent upon the decision arrived at with regard to this matter. Yet, even if no additions be

made to the Scientific staff, consideration of the question of office organization cannot be safely postponed.

So much information regarding the various subjects before the Association is now given in *The Planters' Chronicle* that only brief references need be made here to the principal Resolutions adopted at the last Annual Meeting and to other matters that have since come to the front.

The Scientific Officer.—Mr. R. D. Anstead, B.A., carried out as far as possible the programme drawn up for him last year. Certain slight changes were rendered necessary by circumstances, however, as the original programme failed to make sufficient allowance for the exigencies of the weather, and imposed upon the Scientific Officer a very heavy strain.

With reference to the above Officer a question has been raised lately regarding the right of subscribers (under a guarantee for several years) to the Scientific Officer Fund to personal advice from the Scientific Officer even when such subscribers have ceased to be members of a District Planters' Association. This related to a specific complaint that Mr. Anstead failed to visit the estate of one subscriber of the kind under reference. The papers were first laid before Mr. R. D. Tipping, who was then Chairman, and after his death were submitted to the new Chairman, Mr. C. H. Brock, whose ruling was as follows:—

"(1) That, pending definite rules being laid down at the next U. P. A. S. I. Meeting, anyone who has guaranteed a subscription for a term of years is entitled to assistance from the Scientific Officer during that term, even though he may cease to be a member of his District Association.

"(2) That Mr. Anstead's Programme, as laid down at an Annual General Meeting of the U. P. A. S. I., must be adhered to.

"(3) That any subscriber to the Scientific Officer Fund, knowing the programme of tours, as he should, must arrange for Mr. Anstead's services during his regular tour, through the medium of the Hony. Secretary of his Association, or whoever may be arranging the details of such tour."

Accordingly, the question will come up for consideration at the present meeting.

Intimately connected with it is a minor question: *viz.*, whether in circumstances such as those noted above a subscriber to the Scientific Officer Fund is, or is not, entitled to a free copy of *The Planters' Chronicle.* It seems desirable that this point also should be discussed.

Experiment Plots and Hybridisation of Coffee.—There is nothing on record concerning this matter beyond the fact that the Government of Madras have agreed to provide a suitable plot on the Nilgiris, to be under the joint control of Mr. F. H. Butcher, Curator of Government Botanic Gardens, the Nilgiris, and Mr. Anstead, conditional upon the expenses of management being paid by this Association. Several subscriptions have been promised already.

Government Purchases of Cinchona.—The resolution on this subject was entrusted to the Planting Member of Council. Government have declined to comply with the request made by the Association.

Labour Matters.—The Madras Government have confirmed their former statements, which are to the effect that reciprocal treatment with respect to cooly labourers between British territory and the Native States can only be possible if Act I of 1903 is adopted in the districts of the Madras Presidency concerned; and if legislation on the lines of that Act is resorted to within the Native States. These conditions are alluded to as an

"essential preliminary" to action on the part of Government along the lines of the Association's desires.

Regarding the attestation of agreements under the above Act, the Mysore Government have pointed out that the Act is operative only in the Presidency of Madras and that no appointments of attesting Magistrates can therefore be made thereunder in Mysore.

In respect to complaints about non-service of warrants and the request made for an increase of the Police Force in the districts concerned, the Government of Madras communicated with the Inspector-General of Police in Mysore and District Magistrates of Madras Districts. With special reference to the Coimbatore District it was further stated that the Police Force there "will be largely increased under the general reorganization scheme now in progress."

The Mysore Government, dealing with this matter, in orders to local officials, requested "that special attention may be devoted to the execution of the warrants referred to therein and that due notice may be taken of the conduct of the Police where non-service is due to their negligence."

As to Emigration of Coolies the Madras Government stated:—"The Government are satisfied with the existing situation, and consider further control over emigration in the interests of coolies uncalled for. Endeavour is always made to rectify any case of abuse which comes to the notice of Government, through the periodical reports they receive as to the condition of oversea emigrants and otherwise, and they have no reason to believe that the general condition of emigrants is such as to call for legislative action." They regretted, therefore, that they were unable to support the proposal of the Association for fresh legislation in the matter in the directions indicated in the resolution adopted last year.

Towards the close of the official year under reference the report of the U. P. A. S. I. Labour Committee was submitted, and it may be added that special "Labour Maps" have been prepared to show the localities in which coolies are recruited for the different planting districts.

The particular attention of the U. P. A. S. I. has been invited by one of the affiliated District Planters' Associations to the efforts which are being made by the Indian Tea Association, Calcutta, to get the Madras Government to open the Agency tracts to North Indian Recruiters.

Ceylon Import Duty on Tea.—Delay in the preparation of the necessary "brief" for Sir J. D. Rees, M. P., caused this matter to stand over till the eve of a General Election, so that a further postponement was unavoidable. At the election, Sir J. D. Rees was not again returned; and the resolution passed last year could not, therefore, be acted upon.

Bonus on Green Tea.—The Indian Tea Cess Committee declined to accede to the Association's request for a restoration of the bonus. Mr. A. D. Jackson, of Madras, represented the case, in the absence of a representative of the U. P. A. S. I., but his strenuous endeavours failed to make any impression upon other members of the Committee.

Coffee Curing.—Curers appear to think that there are no improvements available in regard to curing machinery, and all are indisposed to reduce their present charges. If definite suggestions as to improved machines or methods could be put forward they would probably receive consideration.

Proposed Coffee Cess.—The Government of India have not seen their way to modify the former adverse decision.

Imperial Preferential Tariff.—Last year's resolution on this subject has been circulated very widely, and has elicited a large number of comments, mostly approving its gist.

Roads and Communications.—At the Annual Meeting of the Madura District Board in 1910 it was resolved that until the revised contract with the South Indian Railway comes into force nothing can be done in the way of settlement of terms in respect to the Vaigay Valley Railway project.

Regarding the Attur Ghât road the same Board has declared its inability to find money to put the road into repair. In August last "the question as to the future of the road" was said to be before Government, and nothing further has been heard about the matter since then.

The Arsikere-Mangalore Railway project has been indefinitely hung up. In September 1909 the Government of India stated that they would be prepared to give their sympathetic consideration should any private company come forward with proposals to finance the construction of this line. It now appears probable that the terms of the new contract to be entered into between the Secretary of State and the South Indian Railway Company contain certain provisions with regard to Railway Construction in Southern India which will preclude the Railway Board from giving their support to the construction of this line by a private Company.

Under instructions from the Chairman (Mr. Brock) the Railway Board was asked about prospects in regard to the Dindigul-Pollachi-Palghat line, which was stated by the Planting Member of Council (Mr. Hodgson) in 1907 to have been "given a high place by the Government of Madras in their programme of construction of new lines" and to be likely to be commenced in 1908-09.

The reply received was that the Board "regret they are unable to say when the line will be constructed."

Prevention of Thefts of Produce.—Representations as to the necessity of special legislation for the prevention of thefts of Rubber, Tea, Pepper and Cardamoms have proved of no avail. The Madras Government "do not find that there are sufficient grounds to justify the special legislation desired by the Association."

A Regulation for the Prevention of Thefts of Rubber within the Travancore State was introduced into the Legislative Council of that State during the year by Mr. J. A. Richardson, but the result has not transpired.

Proposed Pest Act.—Although it is understood that there is little prospect of the adoption of a Pest Act such as was in view when a resolution on the subject was passed last year, the Government of India appear likely to take a step in the right direction by passing a law to control the importation of plants, grafts, seeds, and the like, in order to prevent the introduction into this country of insect pests and fungoid diseases. A proposal to this effect has received the approval of the Association, and though the Act contemplated will fall very far short of the aims of a Pest Act dealing with pests and diseases already established in India there is some room for hope that experience with respect to the one piece of legislation may serve to bring more prominently to the front the necessity for the other.

The International Rubber Exhibition.—This subject is touched upon with considerable diffidence because of the absence of precise information concerning the exhibits sent forward. These exhibits were not despatched through the U. P. A. S. I. office, and it was only on the eve of the opening of the Exhibition that your Secretary had reason to fear that their number

was very small. Mr. J. A. Richardson, Chairman of the Committee appointed to make the necessary arrangements in London, has sent in an official report on the South Indian stall; and the financial aspect of affairs is shown, as far as can be done at present, in the Accounts section of this report. The office had to deal with a considerable amount of correspondence in connection with the Exhibition, as well as with the revision of the manuscript for the handbook.

An Appeal.—At the instance of the Planters' Association of Ceylon the District Planters' Associations affiliated to the U. P. A. S. I. were invited to consider an appeal made with a view to the presentation of a testimonal to Mr. H. A. Wickham, the introducer of Pará Rubber Seed into the East.

Publications.—The annual Book of Proceedings was issued as usual; sales were not quite satisfactory.

In regard to *The Planters' Chronicle* a great advance has been made. Publication every week, instead of monthly as before, seems to have enhanced the popularity of the paper very much, and advertising support has increased very materially. Contributions by the Scientific Officer have been forthcoming in liberal measure and have assured to the *Chronicle* a welcome in the homes of planters in South India. It would become much more worthy of that welcome if planters themselves would send a more generous supply of occasional contributions, to promote discussion on planting subjects, and if they would also offer suggestions and criticisms more freely than they have done in the past.

Accounts for the year, duly certified by the Auditor, have been laid on the table. In a measure, the figures indicate the increasing strain imposed by the growth of the Association's work. They also establish a new record in respect to financial turnover. A comparison of Actuals with Estimates shows the following totals in the General Fund:

	Estimate.	Actual.
Receipts ...	... Rs.8,166 1 10	Rs.8,968 7 7
Disbursements	.. ,, 7,900 0 0	,, 8,245 13 4

It must be noted, however, that the Income comprises Rs.410-6 received on account of subscription for *1911-12*, besides a sum of Rs.454-6 received as third dividend from the insolvent estate of Messrs. Arbuthnot & Co. and transferred to the Reserve Fund, together with Rs.45-10 to make up a round sum of Rs.500. The above two items cannot be reckoned as part of the ordinary receipts for the year 1910-11, the real total of which is Rs.8,968-7-7 *minus* Rs.410-6 and Rs.454-6, or Rs.8,103-11-7.

On the Disbursements side two items that were not anticipated at the beginning of the year, *viz.*, Labour Maps and Enlarged Photograph, have involved an expenditure of Rs.148-4 that was not provided for in estimates. Moreover, the expansion of business has rendered necessary a larger outlay than was expected on Postages, Stationery and Petties: in the case of the first item to the extent of 60 per cent.; the second nearly 150 per cent.; and the third nearly cent. per cent. over the "actuals" of 1909-10. The figures affected are not large, but the increases noted deserve special mention because of their intimate relation to the increase of work.

Last year sanction was taken for the temporary use of any portion of the Reserve Fund that might be required in connection with the fitting up of the Laboratory for the Scientific Officer; and experience has demonstrated the wisdom of this course. When all the promised subscriptions towards the cost of the Laboratory come in the loans taken from the Reserve Fund will be replaced. Already (up to the 25th August 1911) a sum of Rs.640-15-6

has been received on this account since the close of the financial year with which this present report is more particularly concerned.

It will be seen that the International Rubber Exhibition Fund showed at the close of the year a cash balance of Rs.4,471-5-5. Accounts of expenditure in London had, however, not been received at that time; and if Mr. Richardson's estimate of total outlay turns out to be correct the above balance will be materially reduced, as only £350 was remitted home before the 30th June last. Besides this there is at least one claim in India that has to be taken into consideration.

Owing to demands in connection with the Laboratory, to uncertainty as to the demands likely to be made from London in respect to the International Rubber Exhibition, and to the late receipt of a number of subscriptions of one kind or another, the fixed deposit carried over from last year was not renewed at maturity. If circumstances had permitted, it would have been reinvested at a later date; but this could only have been done almost at the close of the financial year, and by then there were complications which rendered it desirable that all the funds of the Association (with the sole exception of the S. I. P. B. F. already invested in Government Securities) should be held at call. Hence the large amount held in current account with bankers at the close of the year.

The Reserve Fund has increased from Rs.2,000 to Rs.2,500; but, as explained above, a portion of this has been temporarily invested in connection with the Laboratory.

In the S. I. P. B. F. accounts only a small cash balance of Rs.325-8-7 is shown, but investments in Government Paper now total Rs.10,000. Happily, there have been no demands made on this fund hitherto; and as the subscriptions for 1911-12 come in further investments should become possible. Special mention may be made of the fact that through the kind offices of Messrs. T. H. Allen & Co., of London, donations from London brokers, &c., to the value of Rs.1,797-3-4 were collected during the year, and the above firm has encouraged the idea that in this instance gratitude may be correctly described as mingled with a lively sense of hope of further favours to come.

In conclusion, your Secretary begs to tender his resignation.

Accounts.

Statements of Accounts, which had been laid on the table, were left over for consideration at a later stage of the proceedings.

Chairman's Opening Address.

The Chairman then spoke as follows:—

GENTLEMEN,—Owing to a double disaster I find myself for a second time the unfortunate holder of your two highest offices, a record which I hope will not be repeated. The mistake, for it is one, would not have been made this time had we elected, as we should have done, a new Vice-Chairman on Mr. Brock's succession to the higher office. It has always been held inadvisable that one man should be Chairman and also Planting Member, but it was twice necessary as a temporary measure before my first offence. If it was bad policy in the past it is very much more so now that your work is becoming so increasingly strenuous year by year. Had it been a matter extending over more than a few weeks this time I should not have felt able to carry on the dual office, and during the cold weather no one who has other work could do you justice.

I have been recently re-reading the Proceedings of our first Meeting, and find that in opening the discussion on the subject of an Annual Conference

versus a Permanent Association I warned Delegates not to think that when Act XIII was disposed of there would be no work to do. Even I, with all the sanguine hopefulness of youth, did not then foresee what a growth there would be. I remember that we started with an income of Rs.2,400, which was thought ample; we have now over Rs.7,000 and are hampered in every direction by want of funds. All this means that a Chairman who is not content to be a mere name will find plenty to do.

The loss we sustained by the death of our Chairman, the late Mr. R. D. Tipping, is perhaps greater than we had time to realise. Men of his stamp are not common enough, and many of us confidently looked for useful work from him. There was no time to prove his value, but I hope that one thing will become a memorial to him, and that thing is some improvement in our Scientific Department, a matter to which he intended to pay great attention.

Mr. Brock's temporary withdrawal from active work is also a great disappointment to us, as well, I know, as to himself. One of our keenest spirits and most thorough workers, we cannot spare him for long, and I hope he will soon return and take his place among our leaders.

Death has taken away another of the Old Guard, our genial old friend H. G. Parsons. An attractive speaker, hard yet good-natured debater, we missed him when he gave up Planting, and have now lost him for ever after a short return to our company last year.

Two more good men have left India, and though we can rely on their help whenever we are able to consult them, the departure of George Romilly and J. A. Harris has left a big gap in my life personally and yours politically, if that is the right word. They had been intimate friends of mine and hard workers with and for us all since I first knew them over twenty years ago, and Mr. Romilly had been working for many years then; in fact, I only came to make his acquaintance through my early efforts towards this Association, he being at that time the most prominent Honorary Secretary of a Planters' Association and my strongest supporter and helper.

You will not expect as full an address from me as could be demanded from one who had been in charge of affairs for the whole year, but I have endeavoured to draw some information from your records as well as from the frequent intercourse which I have held with your Office and Officers, and if I make no attempt to separate Legislative from general business you will perhaps be kind enough to forgive me.

COFFEE.—The market is in a much more healthy state than has been the case for years past, and while it must be admitted that speculation still influence the Terme market, if not the Spot one, to an undesirable extent, there is no doubt that the statistical position shows such satisfactory features that prospects can be safely called vastly improved.

TEA.—While the promised boom has failed to materialize to the full extent hoped for, I think it is permissible to say that, in my opinion, South India has done very well in the past year and has every prospect of a brilliant future if only the one great trouble common to all of us can be got over. For Tea more than for any other of our industries, a steady supply of labour is needed. Quality on the whole seems to have been more than maintained, and no serious diseases have taken possession. Very large acreages have been opened up, which is the best proof possible of a satisfactory position.

RUBBER.—In this also large extensions are being made. Prices, while far below the unhealthy inflated range of last year, are at a level which will give all honest concerns a very good return. There can be no doubt that

much rubbish in the way of Companies remains to be weeded out, but there would appear to be practically none in South India.

CINCHONA—cannot, I fear, be taken very seriously, as the Government is firm in its refusal to take the steps which we suggested would preserve the industry with an eye to the future. I can only advise owners of it to make what they can with as little trouble and expense as possible.

CARDAMOMS have perhaps done a little better, while

PEPPER remains depressed.

MEMBERSHIP.—As the Secretary has informed you, we have had the great pleasure of receiving a new member this year, the Bababudin Planters' Association.

COFFEE CESS has again been refused, and I suppose we must take it that this refusal after reconsideration is for the present final. No objections were raised to the scheme, so we can only presume that after the agitation of a minority against the renewal of the Tea Cess in Ceylon (which was successful) the principle is objected to. Government may also have thought that the amount involved was not worth the trouble.

THENI BRIDGE.—With great satisfaction I record the removal of this blot from our Agenda Paper. I hear rumours of an Oliver Twistish desire for more bridges in the same neighbourhood, but no news has come from any Association officially.

SCIENTIFIC DEPARTMENT.—Very rightly this promises to form a large fraction of your programme this year. We are all agreed, I think, that it is futile to go on as at present, for no man can deal satisfactorily with more than about a quarter of our acreage singlehanded. We have to decide whether to advance and have schemes for practical work, or to allow Mr. Anstead to sit in our Headquarters for the greater part of the year and do what he can for us thence. At present most of his life is spent in travelling, and it is time he was allowed to get something done with a reasonable amount of leisure.

PEST ACT.—I have been making some preliminary inquiries from Officials and landholders on this subject, and feel grave doubts as to the possibility of getting all the 5 Governments under which we hold land to agree to an Act such as we desire.

Our position in regard to matters of this kind is one of the greatest difficulty, and cannot be in any way compared with that of Planters, or any other body, who are under one authority and are able to make their wants known by one representation. As to a Pest Act one great trouble is the matter of Government land surrounding private holding; the acreage to be kept free from diseases and pests would in the aggregate amount to something enormous, and I do not see how to deal with this aspect. Unless, therefore, a more or less definite scheme is drafted for me I fear that with all my own work I cannot undertake to press the question. If you will give me a good draft scheme to put into shape I will see what can be done.

LABOUR.—I have nothing to report save that the situation is no more hopeful, perhaps it is less so. Act I remains almost as much out of favour as ever, though there may be some forced conversions, and without it I can hold out no hopes of any form of Extradition.

Leaving aside, however, all Legislative remedies, and the known difficulty of finding any which will suit us all, are there no ways in which we can improve matters amongst ourselves? I do not mean by agreements which cannot be enforced if broken, but some improvements in our methods

of working. For instance, has a system of monthly instead of daily pay been tried, one with a deduction of something more than a day's wage for *unreasonable* absence? We all know that there is a great deal of unnecessary wastage, that with many if not all classes of coolies we have to maintain a force which it might be inconvenient to employ if it turned out steadily to work, because there is always a large proportion who will only work just as many days in a week as is necessary to secure their bazaar money. This, by the way, is one of the inevitably attendant evils of giving big advances, as any planter can see if he thinks over it, and in its turn brings about further wastage; it is notorious that while men on regular work who have to turn out six if not seven days a week (horsekeepers, kitchen coolies, tappal coolies, &c.,) seldom get sick more than we ourselves are liable to do, the known loafer generally gets more or less genuinely ill. We have been told that in some countries it is a regular thing to keep more than are really rquired and to turn them out only when there is work, but if this is so, I do not think that it is right or unavoidable with proper management; I do not think that it is just. I am a Coffee Planter and want many more coolies to pick my crop for a few months than I care to employ for the whole of the usual nine months working season, and I think the same applies to all of us, because there can be very few now-a-days, if any, who get local or other causal labour at that season, and I can assure you that is is very rare in my District to hear of a man turning away coolies just because he has no immediately remunerative work to give them. I do not know if anything such as I suggest has been tried and condemned for good and sufficient reasons, but throw out the idea not as a definite proposal to be discussed but as an instance of the sort of line in which our experts might seek for some relief. Labour-saving devices are worth considering as well as labour-procuring ones.

GREEN TEA.—We were last year instructed to ask for a renewal of the bonus on Green Tea, and the request was duly and properly made. Mr. Jackson, who was kind enough to undertake the task in the unavoidable absence of our own representative, has personally described to me his splendid isolation on the occasion, and although he made no complaint about the reception he had, in fact, did quite the opposite, I think that if you want to ask again we must take care to send someone directly interested in the question to take the burden on his own shoulders.

RUBBER EXHIBITION.—This seems to have been quite successful, and while it is to be regretted that South India was not ready for it owing to the youth of Rubber in most districts, it is satisfactory to be able to record that we collected over Rs.6,000 among planters and, aided by the most liberal assistance of the Madras Government, who gave us Rs.3,000, and donations of Rs.500 from the Government of Travancore and Rs.300 from the Government of Cochin, presented a stall which has been described as most attractive.

Scientific Officer's Report.

1ST JULY 1910 TO 30TH JUNE 1911.

Mr. R. D. ANSTEAD, B. A., Scientific Officer, next read his annual report:—

MR. CHAIRMAN AND GENTLEMEN,

I have the honour to present to you my second Annual Report as Planting Expert and Scientific Officer to the U.P.A.S.I. This Report is drafted upon the lines adopted in my Report of last year, and deals with general matters only; any detailed discussion of pests, diseases, and

manures, will be dealt with under their separate headings on the Agenda Paper.

Office and Correspondence.

My office staff throughout the year has consisted of one writer and one peon, and the upkeep of this staff is met by a contribution from the Government of Madras.

The office work has shown a large increase during the year, the number of letters received being 536, as compared with 217 last year, and the number written being 534, as compared with 210 last year. The majority of these letters have been from planters asking for advice about manuring, cultivation, pests, etc., etc., and they have all received my personal attention, so that correspondence alone takes up a large amount of my time when I am at head-quarters. Should this branch of the work increase in the same proportion during the coming year as it has done during the year under review, a second writer will become necessary, since the bulk of this correspondence can, of course, only be dealt with during my presence at head-quarters.

The "Planters' Chronicle."

I have contributed regularly to the pages of the *Planters' Chronicle*, which has been issued as a weekly throughout the year, and have written for it, 35 Papers, and 62 Notes, as well as Miscellaneous items. The publication has been used as a medium of communication with planters, and in its pages the questions asked by correspondents, when of general interest, have been dealt with. I am glad to be able to report that the *Chronicle* appears to have gained a high place in the planters' regard and is regularly read by them. There is still, however, room for improvement, and I am often asked questions which have already been answered in the *Chronicle*, thus giving me unnecessary work. The Secretary and I are always pleased to receive suggestions for making the *Chronicle* more interesting and efficient, and I deplore the fact that more contributions to its pages are not received from the planters themselves, and that the Correspondence columns are not more used freely in preference to those of the daily Press.

Herbarium and Collections.

Little work has been done on these during the year, for want of time. The collection of Leguminous Plants suitable for green dressings and cover crops has been added to to some extent, however, and my thanks are due to Dr. Barber, the Government Botanist, stationed at Coimbatore, for his kindness in checking determinations and naming plants, from herbarium specimens sent to him.

A Microscope and collecting apparatus have been received from the Government of Madras, and, given the necessary time, plant diseases can now be studied in detail at the office.

Tours.

The majority of my time, during the period under review, has been occupied in touring in the planting districts, and in visiting estates. The following districts have been visited in the order given, most of them for the second time, though in many cases new ground has been covered:—Wynaad, South Malabar, Cochin, Mundakayam, Central Travancore, Coorg, South Mysore, Anamalais, Shevaroys, Nilgiris, South Travancore, North Mysore. In addition to this I made special visits to Coimbatore and Hunsur to inspect Coffee Curing works in connection with a preliminary investigation into the question of the Quality and Curing of Coffee.

These tours have necessitated my being absent from headquarters for 176 days, and travelling a distance of 4,438 miles by rail, and 2,004 miles by road. Last year I travelled 1,800 miles by road. As during last year all the tours have had to be made rapidly, and no detailed work could be done during their progress.

During most of my tours I was able to attend meetings of the District Planters' Associations, and in many cases special meetings were arranged for me, and on these occasions I delivered lectures, twelve in all. I should like to take this opportunity of expressing my thanks to the Honorary Secretaries of the District Planters' Associations for the arrangements they have made for me, and to all those who have so generously afforded me transport facilities, and helped to make my tours easy and successful.

It will be seen that this touring is no light task, however, and I must point out that the strain is too great, and request that in the future my touring should be largely reduced. I find that my health will not stand the strain of constantly knocking about the country in all weathers, in addition to all the other work that there is to do. I have now visited all the planting districts connected with the Scientific Department of the U. P. A. S. I., and some of them twice, and I have a very fair working idea of their conditions. Moreover, I have given all the advice which it is possible for me to give from a casual inspection of estates, and it is impossible for me to do more when my visits are confined to a few weeks in each district, much of the time being taken up in actual moving from place to place. I can now give just as good advice from my office as I could on the estate, upon points which do not need field study. I cannot say anything new about 'Green Bug' or 'Mosquito Blight,' for example, by inspecting a dozen more estates which are attacked by these diseases; having once seen them, and knowing the local conditions obtaining in the district, nothing is gained by further casual inspection of them. The same applies to other diseases.

I would suggest that I now be allowed to work at head-quarters on definite problems, and that my touring be confined to a few districts each year, so that I may tour at leisure and spend more time in the districts visited.

This raises another question, that of assistance. The work of the Scientific Department has increased so enormously during the last two years that it has reached a point when it is impossible for one man to deal efficiently with it all. Research work is needed, and also field work, if the utmost possible benefit is to be obtained from the Scientific Department, and it is quite impossible for one man to do both over such a big field as Southern India, with its varying soils, climates, and crops, and its great distances. I therefore have the honour to request that the Scientific staff may be increased, and I am very glad to know that you will have under consideration at this meeting a Scheme (originally brought forward by Mr. Browne) the adoption of which would necessarily supply me with assistance such as I need. I feel confident that you will recognise that it is impossible for me to do more than I am doing now, or to continue working at such high pressure in future years, and that the scheme will receive your earnest attention.

Manuring and Experiment Plots.

At the Annual Meeting in 1910 a Scheme was adopted whereby Experiment Plots were to be established on estates in each district upon which experiments could be carried out, and local Committees were to be appointed to arrange for this.

During the period under review this scheme has been carried out in

some districts, and, as far as I have been able to ascertain, experiments on the following subjects are being carried out in the districts named :—

NORTH MYSORE	... Effect on Stump Rot of Fungicides applied to the Soil.
BABABUDINS	... Manurial Experiments with Coffee.
SOUTH MYSORE	... The quantity of Mulch deposited from shade trees, and its manurial value.
	... Conservation in pits of Composts of pulp and line sweepings.
	... Effect of Bordeaux Mixture on Black Rot of Coffee.
	... Leguminous Green Dressings for Coffee.
ANAMALAIS	... Conservation in pits of Composts of Pulp and line sweepings.
	... Nitrolim as a fertiliser for Coffee.
COORG	... Effect of fertilisers on the latex yield of Ceará Rubber.
	... Green Dressings for Coffee and Rubber.
NILGIRIS	... Pruning Tea to control Purple Mite.
	... Nitrolim as a fertiliser for Tea.
	... Green Dressings for Tea.
	... Coffee Manurial Experiments.
WYNAAD	... Green Dressings for Tea.
MUNDAKAYAM	... Effect of fertilisers on the latex yield of Hevea Rubber.
CENTRAL TRAVANCORE	... Green Dressings for Tea.
COCHIN & SOUTH MALABAR	... Manurial Experiments with Hevea Rubber.
	... Pollarding Hevea as compared with cutting out when thinning becomes necessary.
	... Green Dressings for Rubber.
	... Pink Disease and Bordeaux Mixture.

The results of some of these experiments have already been published in the *Planters' Chronicle* ; and future results will be published from time to time as they become available. Some experiment plots exist only on paper, it is to be feared ; and in order to derive the full benefit from the Scheme, it is necessary to have a scientifically trained man to take charge of the experiments and see that they are carried out. Should Assistants be appointed in the different districts it is proposed that this should be a special part of their duties.

Work upon Hybrid Coffee has been continued during the year, and in Coorg an additional plot of existing Hybrids has been taken up experimentally.

I have gained the sanction of the Government of Madras to the allotment of a piece of Government land in the Nilgiris where this work can be carried out in a systematic way by Mr. Butcher, the Curator of the Government Gardens and Parks, the Nilgiris, and myself, subject to certain conditions which will be laid before you during the course of the meeting, and I request your consent to these conditions.

LABORATORY.

The sum of Rs.2,500 was sanctioned at the Annual Meeting in 1910 for the establishment of a laboratory, and this has been fitted up in the premises adjoining the office. It was ready for use by the 1st January 1911, and a certain amount of work has been done in it, and it has already proved a useful aid to my work.

BORDEAUX MIXTURE AND PINK DISEASE.

The most important piece of work which has been done during the period under review is the investigation of a method for controlling Pink Disease (*Corticium javanicum*), a fungoid disease of Hevea Rubber. Experiments in connection with this were begun on Palapilly Estate early in 1910 and have, I am glad to report, resulted in the discovery of a completely successful method of dealing with a disease which has in the past caused a considerable amount of loss to Rubber Planters.

The method adopted is a preventive one. All the trees liable to attack should be painted in the forks with the Bordeaux Mixture in the dry weather. The spores of the fungus germinate in a medium of Bordeaux Mixture when the rains come, and are thus killed. This method has been found in the field to reduce the number of trees attacked by the disease to about one per acre at a cost of less than Rs.2 per acre, while Mr. Gudgeon, the Manager of Palapilly Estate at the time the experiments were conducted, reported that he believed that "if every tree was done properly there would be no cases of Pink Disease."

This may, therefore, be considered as a piece of work which has been finished, and the method recommended should be generally adopted. Meanwhile the experiments are being continued in order to clear up a few details, and enable us to standardise the method and reduce it to its lowest factor of economy consistent with efficiency.

WORK IN PROGRESS.

Among investigations in progress the following may be noted as of special interest. Fairly extensive trials are being made with various Leguminous Plants as Green Dressings and Cover Crops, and *Tephrosia purpurea* seems to be the most suitable plant to use for the purpose in our planting districts. Seed is available in quantity, and about three tons were obtained during the year and distributed through the U.P.A.S.I. Office.

Trials of the Nitrogenous fertiliser Nitrolim are being made on Coffee, Tea, and Rubber, but it is as yet too early for results to be available. Methods of treatment of old coffee attacked by Stump Rot, caused by the fungus *Hymenochoeta noxia*, have been actively taken up, and it is now generally recognised what this disease is and the harm it may do. Considerable progress has been made with methods of tapping and preparation of Ceará Rubber during the year, and an investigation has been begun upon the possibility of increasing the latex flow by the use of Nitrate of Soda as a fertiliser. A preliminary trial of crushing Hevea seeds, extracting the oil from them, and preparing a poonac, has been carried out. This trial was not altogether successful, owing to want of proper machinery, but analyses showed that the residual poonac from Hevea seeds after all the oil has been removed is a valuable one, and the experiments will be renewed during the coming fruiting season.

PEST ACT.

It would appear that a Pest Act is not feasible. An Act is under consideration by the Government of India, however, to enforce the fumigation and disinfection of imported plants, and thus prevent the introduction of

new diseases. This is a step in the right direction, and I am glad to note that it has been supported by the U. P. A. S. I. Every effort should be made locally to prevent the introduction of pests from one district into another, and I strongly advise all Tea Planters to disinfect Tea seed imported from the North of India, by soaking it in a solution of Formalin, to guard against the possible introduction of Blister Blight. I am glad to note that the Mysore Planters' Association have taken measures during the year to avoid introducing the Green Bug (*Lecanium viride*) on to their Coffee.

AGRICULTURE AT ANNUAL MEETINGS.

In my Report last year I had the honour to recommend that at least one purely agricultural subject should be taken up at this meeting for discussion, and that an attempt should be made to get a planter to deliver a lecture on the subject chosen. I regret to have to report that attempts to arrange this have met with no success, but I once more put forward the recommendation. I also believe that the District Associations would become more popular, and awaken more general interest in improved agricultural methods, if they occasionally had such discussions and lectures at their meetings, combined with a small exhibition to illustrate the subject of the lecture, or matter under discussion.

In conclusion I desire to record my very grateful appreciation of the kindly and sympathetic assistance I have received throughout the year from the Secretary of the U. P. A. S. I.

The Scientific Officer.

The Chairman then moved the following resolution :—

"That the Scientific Officer be permitted to move Resolutions at the Meetings of the U. P. A. S. I., but not to vote."

This was discussed in open meeting and in committee, and was eventually carried.

Subsequently the subjects of *Weights and Measures*, and *Roads and Communications*, were taken up and discussed, until the meeting closed at 5 p.m.

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SECOND DAY—AUGUST 29, 1911.

The Scientific Department.

After close discussion of the suggested scheme for the appointment of one or more Scientific Assistants it was *resolved* :—

"That as the Mysore Associations have united together to supply the U. P. A. with funds to employ an assistant to Mr. Anstead on the lines of the scheme laid down by the late Mr. R. D. Tipping, the other Associations connected with the U. P. A. be asked to make every endeavour to follow suit."

The subject was then held over pending consideration of details in connection with the above.

Scientific Officer's Programme.

It was *resolved* : "That when an Association requires the services of Mr. Anstead, at least a month or six weeks notice be given beforehand to the Chairman through the Secretary, U. P. A. S. I., to enable him to consult with Mr. Anstead and arrange for a tour in the district requiring the Scientific Officer ; and that should more than one District desire his presence at the same time, the one whose application was first received in the office should have the preference."

"That Honorary Secretaries be in no way bound to make arrangements for the Scientific Officer to visit non-members or to guarantee that such visit shall be made, but should a non-member who has subscribed to the Scientific Officer Fund intimate to an Honorary Secretary that he desires a visit it is, in the opinion of this Meeting, the duty of that Honorary Secretary to consider his request on its merits."

Hybridisation of Coffee.

The following Resolution was adopted :—

"That on the understanding that the following Associations do guarantee the payment of their share of the cost up to a maximum of the amounts hereinunder written against their names the Secretary of the U. P. A. S. I. should be, and hereby is, empowered to enter into definite negotiations with the Government of Madras for commencing operations on the Nilgiri Experimental plot for hybridisation :—

Nilgiris	...	...	...	Rs.100
North Mysore	...	...	...	„ 100
Coorg	...	...	...	„ 100
South Mysore	...	...	...	„ 75
Bababudin	...	...	...	„ 50
Shevaroy	...	...	...	„ 50
				Rs.475

Indian Tea Cess Committee.

Mr. J. Carson Parker was elected for nomination by the Government of India as representative of the U. P. A. S. I. on the above Committee, in succession to Mr. George Romilly.

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THIRD DAY—AUGUST 30, 1911.

Fungi.

MR. W. MCRAE, Madras Mycologist, who was one of the visitors present, delivered a very instructive lecture on the above subject. He remarked :—

When Mr. Anstead asked me to talk to you for a few minutes about fungi I had some difficulty in thinking of a suitable subject. My work, you see, has lain almost exclusively on the plains, where it is the diseases of cholam, sugar-cane and palm trees that call for attention, but these are of little interest to planters. So I have decided simply to make a few general remarks, which, I hope, will prove not uninteresting.

A fungus is a plant. As you know, a plant may consist of a single small cell or of several cells. The plants with which we are familiar are made up of a great many cells grouped together in various ways. This can be seen quite well with the aid of a low power miscroscope. These cells contain the living matter of the plant called protoplasm. Green plants have, in addition, a green colouring matter embedded in their living substance. This colouring matter acts as a sort of screen to absorb the radiant energy of the sun's rays. This enables the protoplasm to take the simple inorganic substances like nitrates and phosphates which the plant has absorbed from the soil

through its roots and like oxygen and carbonic-acid gas which it has taken in from the air through its breathing pores, and to manufacture from them complex chemical substances like sugars and starches. Then the plant uses these sugars and starches for its further growth and development.

A fungus also requires these complex chemical substances to enable it to grow and develop. But a fungus has no green colouring matter in its cells like the higher plant. It cannot make its food for itself, from simple inorganic substances in the soil and air. It has to get its food already manufactured. The only things that can manufacture their own food supply from the simple constituents of the soil and air are green plants. The obvious thing for a fungus to do, then, is to use the matter contained in the bodies of green plants after they are dead. The bodies of animals, which are really dependent on green plants for their food supply, is a second possible source of food for fungi. As a matter of fact fungi utilise the bodies of both plants and animals. Those that feed on dead bodies we call saprophytes. They are as a rule beneficial in that they help to dispose of these dead bodies, and in this way act as scavengers; but they may cause some annoyance and loss when, for example, they occur, as moulds, on stored grain or eatables like cheese and fruits. Such fungi, however, it is easy enough to keep in check. But not content with using dead plants and animals as a source of food, some fungi have learned how to invade the tissues of living plants and animals and to extract food from their living cell, Such fungi we call parasites. They are prejudicial, especially as they attack and kill plants that are of economic value to us. There is an intermediate class of fungi which can attack some living plants, or, if necessary, can live on dead vegetable matter. These may be called possible parasites. Such fungi are among the most difficult to deal with, when they assume the parasite habit and get a good hold of a crop, because when they have killed their host plant, they are able to go on living and to produce further stages of development on the dead bodies of their host.

There is available, at the present time, a considerable amount of information about the diseases of Southern India chiefly in writings of officers in Ceylon and the Malay Peninsula. Much, however, still remains to be done in Southern India on these very diseases. In addition to their life histories we want to know a great deal more about their seasonal occurrence, of how they are influenced by the various changes of climate and rainfall that occur from place to place and from year to year. Besides these, there are quite a number of diseases of not inconsiderable importance about which we know nothing at all. The field for investigation by a mycologist is a wide and interesting one, and his studies resulting in the discovery of efficient means for reducing the damage done by parasitic fungi, will be of much profit to planters.

To the planter and the mycologist parasites are perhaps the most interesting of fungi. The planter wants to know how to keep them off the plants he cultivates; the mycologist wants to find how they have solved the various problems presented to them in their adaptation to the parasitic life. Fortunately, the two interests harmonise, for, in tracing out the life-history of a parasitic fungus, one is able to spot the weak point in development, at which it is most susceptible to outside influence and to direct the attack at the proper time and place. It is here that the labours of a trained mycologist are of value to planters. Investigation of the life history of parasitic fungi, is a specialised study. They are small organisms and require continued use of the microscope. A well-equipped laboratory is also necessary for the preparation of media and means for the isolation and study

of artificial cultures and for the study of the relationship of fungus and host. This work has become more and more important in recent years. A few of the simpler problems a fungi have had to solve in assuming the parasitic habit are (1) how to get inside the body of the plant; (2) how to get inside the cells of the plant where the food is made and stored; and (3) how to get their own reproductive parts (or spores) distributed.

Let us take the first problem, namely, how to get inside the body of the plant. You all know that fungi produce spores or germs that are blown on to green plants or that reach them in some other way, as on the bodies of insects that fly from plant to plant, or on the implements used in cultivation. Let us start then with a spore. In its simplest form it is a single cell. It may, however, consist of 2, 3, 4, 10 or more cells united together. It may be a thin walled spore that requires a longer or shorter period of rest before it begins to grow. The diversity of form and adaptation of spores is great and is an interesting subject, to which we must not, however, digress. A spore gets on to the outside of a plant. In suitable conditions of warmth and moisture it germinates, *i.e.*, from a part of its surface it sends forth a thin tube called a germ-tube, and at this tube the protoplasm or living substance passes. The tube grows on the outside of the plants and gets inside the body of the plant either through the breathing pores which are natural openings, or it bores through the outer covering of the plant by producing a ferment at its tip which dissolves the cell-walls. Now it is inside the plant's body, and it has still to decide how it is going to get inside the cells in order to get at the food material of the host plant. Some fungi go straight ahead in a business-like way. At the tips of their fine tubes they produce a ferment which dissolves the cell-walls and allows the tubes to enter the cells and get at the food material. They may bore their way out in the same way as they got in, and then bore into the adjacent cells. Other fungi are more delicate in their method. The tubes once inside the body of the plant grow and branch in the spaces between the cells where there is plenty of air. From the parts of the surface of their branches a ferment is secreted which disolves the cell-wall, and the fine tubes grow into the cell and act as suckers to absorb the food inside the cell of the host plant. Other fungi, again, simply place their tubes in close contact with the cells of their host plants and absorb food through the cell-wall, without actually penetrating the cells. One group of fungi, the mildews, have decided not to go inside the body of the host plant at all. They remain on the surface and simply send suckers into the cells below. Now that the fungus has access to a plentiful supply of food it develops rapidly, and its presence usually causes some modification in growth or structure of the host plant. Such changes are most diverse, varying from minute modifications of a single cell or of a small group of cells to those changes which give rise to relatively large deformities such as clubroot of cabbage, pocket plums and cankers.

As a rule, the fungi with which we are familiar in our economic plants gradually ramify through the cells of the whole plant. Not only is there a drain of food material from the host plant, but the fungus actively kills the cells into which it grows or into which it sends suckers, and ultimately causes the death of its host. Hence a fungus has to make provision for the continuance of its species after the death of its host plant. This it does by producing spores. It would obviously be an advantage to produce the spores in the outside of the plant, for they could then be more readily distributed to other plants than to produce them within the plant, for then they would have to wait till the plant decayed and disintegrated before they could

be released. Fungi have discovered this, and as a rule they do produce the spores on the surfaces of their host plants. This is the stage when the fungus usually first becomes visible to the casual observer. This is not, however, the first stage. The fungus has been inside the plant for days, weeks or even months doing its work in a silent way. It has been destroying and feeding on the tissues of the plant. Picking off the fruit bodies of a fungus will not destroy it. People often ask me why it is that when they pick off fungus fruit-bodies whenever they appear, the plant attacked never seems to get any better. They do not realise that fruit production is a late stage in the life of a fungus and that the host plant is full of the fungus even though it is not easily seen. Fruit-bodies of fungi vary. Some fungi send out single threads or little groups of threads to the surface and they either pass out through the breathing pores or they bore out. Then they produce spores at their ends. Usually, however, some provision is made for the protection of spores while they are developing by many threads growing together to form some sort of a fruit-body. Fruit-bodies are of the most varied description. You are all familiar with the mushroom, which is the fruit of a fungus which grows underground on decaying leaves, twigs and roots; and with a bracket fungus such as *Fomes* on rubber, which is the fruit of a fungus which lives inside the tree, gradually destroying and absorbing the tree's tissues till it has gained strength and vigour enough to produce fruits. Fruit-bodies of fungi are diversified to the most wonderful extent, and it is by this feature together with the form of the spore that the individual species of fungi are recognised. The number of spores produced by an individual is usually great. It has been calculated that a single mushroom discharged 1,800,000,000 spores in two days or about 40,000,000 per hour, and that a single parasitic bracket fungus, a species of *Fomes*, produced about 11,000,000,000 spores, and this was only one of a group of about ten on the same tree. Such numbers are inconceivably large. Since it may be assumed that the number of fruit bodies of any given species remains fairly constant from year to year, except in times of epidemic, these give us an idea of how many of the spores die and how few, in nature, ever find a suitable place for successful development.

Many questions were put to the lecturer in Committee and kindly answered by him, the Scientific Officer and Mr. G. H. Krumbiegel, Economic Botanist to the Government of Mysore, helping in the discussion.

The Use of 'Natural Manure' on Estates.

Mr. R. D. ANSTEAD, B.A., then spoke as follows:—

The annually increasing price of Bones and Poonac, two of the commonest sources of manure used on estates in Southern India, make it imperative that attention should be turned to substitutes for them. It is for this reason I am anxious to work out a method of extracting the oil from *Hevea* seeds in this country instead of exporting the seeds to Europe to be crushed, so as to retain the residual poonac as a fertiliser. The poonac is said to be suitable for a cattle food, but this aspect of the question does not interest us so much as the fertilising value.

It is especially necessary with a crop like Coffee to find substitutes for high priced manures, since the margin of profits limits the amount which can be expended upon fertilisers.

When I first assumed my duties here two years ago, *viz.*, in May 1909, the price quoted by one well known firm for Raw Bone Meal was Rs.65 per ton; it is quoted in the current price list of the same firm at Rs.80 per ton.

The increase in the price of Poonac is shown in the following table :—

	May 1909.	1911-1912.
White Castor Poonac ...	Rs. 70 per ton.	Rs. 75 per ton.
Black Castor Poonac ...	„ 58 „	„ 60 „
Neem Poonac ...	„ 53 „	„ 60 „
Hoongay Poonac ...	„ 45 „	„ 48 „

Now every estate supplies a certain amount of what may be described as 'natural manure' which when fertilisers can be purchased cheaply it is perhaps not worth while to pay much attention to, but when fertilisers reach a high price these natural resources are well worth looking after.

Coffee is specially fortunate in this respect, since there is a waste product, the Pulp, which is capable of being converted into a valuable manure. Fresh coffee pulp contains about 20% of organic matter, 0·4% of Nitrogen, 1% of Potash, and 1% of Phosphoric Acid.

If this is properly conserved and made into a compost in a watertight covered pit with line and yard sweepings, such manure as is obtained from the cattle working on the estate or visiting it in the transport carts, and the manure obtained from the stables, it will produce a considerable bulk of valuable manure each year. In several places I have got such composts being made, and I hope during the course of the coming year to publish analyses of these, and to show exactly what can be done, and how these composts compare with Bones and Poonac, both in manurial value and price.

But there are other natural resources besides this obvious one of Coffee pulp. Most estates possess a certain amount of waste land, along road sides, round the lines, and so on. These lands are often an untidy mass of Lantana and other coarse weeds, but they might be made a profitable reserve of manure. Leguminous Plants, such as Bengal Bean, and big Crotalarias, should be established on them, and the material cut from time to time and added to the compost heap or used as mulch.

Green Dressings grown in young clearings are capable of supplying more manure that is sometimes realised, and in order to give you some idea of this amount I beg to call your attention to the analyses of two common 'weeds' suitable for green dressings, which I have recently made in my laboratory. Specimens of the plants are on the table before you. Both plants are being experimented with, and the samples were taken from actual experimental plots.

In the case of *Indigofera tinctoria* a patch was grown by itself in a nursery in order to obtain seed in quantity. The amount of material on a square yard was found to be 7 lbs. 9 ounces at the time of flowering. This is equivalent to about 16 tons per acre. When sun-dried the weight was reduced to 1 lb. 9 ounces or $3\frac{1}{2}$ tons per acre.

Tephrosia tinctoria was grown among young Tea in the Wynaad, an account of the experiment being published in the *Planters' Chronicle* (Vol. V. p. 487). The amount of fresh material cut from an area of six square feet weighed 28 lbs 6 ounces equivalent to about 15 tons per acre. This when sun-dried was reduced to 14 lbs. 2 ounces or about $7\frac{1}{2}$ tons per acre.

Analyses of these two plants show that they contain the following amounts of plant food, which has also been calculated to pounds per acre on the basis of the yields quoted above :—

I. Indigofera tinctoria.

—	Leaves.	Stems & Pods.	Whole Plant.	Weight of sun dried material per acre.	Lbs. per acre.
	24%	76%	—	3·5 tons	—
Moisture ...	7·69	7·71	7·70	...	...
*Organic Matter ...	81·91	87·74	87·60	...	3·07 tons.
†Ash ...	10·40	4·55	4·64	...	...
	100·00	100·00	100·00	...	...
*Containing Nitrogen ...	2·66	0·84	1·28	...	100-3 lbs.
†Containing Silica % ...	...	...	7·72	...	...
Phosphoric Acid % ...	...	...	6·86	...	24·9 lbs.
Potash % ...	...	...	13·41	...	48·8 ,,
Lime % ...	...	...	24·26	...	88·25 ,,

II. Tephrosia tinctoria.

—	Leaves.	Stems & Pods.	Whole Plant.	Weight of sun dried material per acre.	Lbs. per acre.
	41·8%	58·2%	—	7·5 tons.	—
Moisture ...	6·32	6·29	6·30	...	...
*Organic Matter ...	88·78	91·12	90·14	...	6·7 tons.
†Ash ...	4·90	2·59	3·56	...	...
	100·00	100·00	100·00	...	...
*Containing Nitrogen ...	2·66	0·77	1·56	...	262 lbs.
†Containing Silica ...	14·28	10·04	12·48	...	...
Phosphoric Acid ...	7·88	7·61	7·76	...	46·4 lbs.
Potash ...	16·93	15·82	16·45	...	219·4 ,,
Lime ...	19·26	21·88	20·37	...	265·5 ,,

The amount of plant food would be supplied by:—

1671·6 lbs. of White Castor Poonac	Costing	... Rs.57	7	9
41 lbs. of Basic Slag	Costing	... ,, 1	4	6
63·4 lbs. of Sulphate of Potash	Costing	... ,, 5	10	6

A total of Rs.64-5-0 in the case of *Indigofera tinctoria*, and

4366·6 lbs. of White Castor Poonac	Costing	... Rs.150	0	0
13·5 lbs. of Basic Slag	Costing	... ,, 0	6	9
351·4 lbs. of Sulphate of Potash	Costing	... ,, 31	6	0

A total of Rs.181-12-9 in the case of *Tephrosia tinctoria*.

It will be observed that in quoting the cost of the equivalents of Poonac and other fertilisers no account has been taken of the cost of transport of these, a very considerable item on some estates, and one of the advantages of such natural manures is that they are produced on the estate, and cost little or nothing for transport.

It may be contended that the plant food supplied by the green dressings has been obtained from the soil and is simply put back again, but this is not altogether correct. The Nitrogen is largely obtained from the air through the medium of the bacteria in the nodules upon the roots of this class of plants, a process with which I take it everyone is familiar. The phosphoric acid, Potash, and Lime are certainly obtained from the soil, but these plants are very deep rooted and much of these materials is wrested from the lower depths where the roots of the crop are not feeding, and they are put into the upper layers where the crop can obtain them, and moreover they are put back in a readily available form when the green dressing rots down. This is especially the case with the Lime.

Suppose, however, we leave out of account these mineral plant foods and value the green dressing upon its Nitrogen content only, which is an undoubted gain to the soil; the *Indigofera* grown on an acre is then worth Rs.57, and the *Tephrosia* Rs.150.

This then is the case for what my clean weeding friends will consider as the 'prisoner.' I contend, gentlemen, that it is a good case, and that the green dressing is not only 'not guilty,' but that in these times of high prices for fertilisers we cannot afford to neglect the benefits it holds out to us.

Miscellaneous.

Various other matters were discussed during the day, and on Thursday and Friday (August 31st and September 1st). A further report regarding a few items will be given in next week's issue; but for the full proceedings planters must be referred, as usual, to the annual book, which will be put through the press as soon as possible.

Particulars of the Election of office-bearers for 1911-12 are given here for convenience of early reference.

Office-bearers, 1911-12.

Chairman ... ... Mr. C. E. ABBOTT, Meppadi.
First Vice-Chairman ... Mr. E. F. BARBER, Ootacamund.
Second Vice-Chairman... Mr. AYLMER Ff. MARTIN, Srivilliputtur.
Secretary ... ... Mr. HARRY ORMEROD, Bangalore.

The meeting was declared closed at about 5-55 p.m. on Friday, September 1, 1911.

The International Rubber Exhibition.

Mr. H. B. Kirk, of the Periyar Rubber Company, writes, under date August 22, 1911.

"To correct a wrong impression which your readers will receive, will you kindly publish this letter? I sent 18 lbs. of Amber Blanket Crepe to my Colombo Agents last year and asked them to select 10 lbs. out of it and send it to the Rubber Exhibition as this Company's exhibit. When I heard that Periyar had no exhibit I wrote to them to inquire and to-day received this reply: 'Exhibition Rubber. This was duly forwarded by us with instructions to London to have the sample exhibited. We have not yet heard if it was actually displayed in the Exhibition."

SOILS AND FERTILISERS.

Mulching.

Here are the advantages of deep mulching;—First, once the soil is moist it prevents evaporation and keeps it moist even through months without rain. Second: It enriches the soil, not only because the lower layers are always in process of rotting and so adding humus and nitrogen to the soil, but with every shower a large amount of atmospheric ammonia (nitrogen) deposited by the rains is retained, and passed into the soil. Third: It keeps the soil at an even temperature, protected from the fierce heat of the sun by day and protected from the often chilly night winds (even in the tropics) as well. Fourth: It prevents the growth of weeds, and so saves expense in weeding. Fifth: On hill-sides it prevents wash.

Mulching, like forking, may seem a simple and easy process, but like every process of cultivation there is a good deal to be learned about it. First, the mulch should not be put against the trunk of the cocoa or banana tree, a clear space of at least a foot should be left around the banana root, and with cocoa all underneath the tree may be left bare,—the shade of the tree itself and the dew dripping down will keep that moist; at any rate the mulch will do harm if placed against the trunk.

Mulching material to cover a large acreage is often difficult and expensive to get. But as the saving in weeding alone of mulch may be put at from £1 to £2 per acre and the profit from the additional moisture kept in soil at £1 and the manurial value at £1, so that the increase of crop may be put at £2 (see results of experiments in Jamaica, April Journal), in ordinary time—while in times of drought the saving may be a whole crop—planters must now consider the providing of mulching material as a part of their estate operations. One planter has started growing grass in every available waste corner, planting it on the side of the trenches too. Another is trying planting his bananas wider between the rows and closer in the rows, while up the middle of the rows he is growing two rows of grass. He claims he gets the same number of banana plants per acre, and that the grass roots will not affect the bananas—being 7 feet from them; while he gets the mulch on the spot. As fast as the grass grows high enough he will cut it and spread on the ground: when the plants are young there is enough grass to go round them; as they grow there is enough grass to mulch further out until he hopes all the ground will be covered and yet the grass in the middle will have enough light to continue growing. Guinea grass, of course, can grow with very little rain compared to what is necessary for the best results in bananas, so that this grass provides probably the best material to be got.

Where plenty of rain falls except over a few months in the year, and yet the dry weather in these months in these districts dries up the soil as much as double the period of dry weather in other districts, and where the area to be mulched is so large, and grass is not plentiful to do all the estates, we believe in the green mulch, that is, growing a leguminous crop such as is being done now by many, but yet not by every one. Heavy coverings of Cowpeas, Jerusalem Peas, Overlook Beans, Bengal Beans, grown until they blossom, then cutlassed down, will provide a good dry mulch for dry periods, while their vigorous roots will have opened up the soil and filled it with nitrogen.—*Journal of the Jamaica Agricultural Society.*

The Planters' Chronicle.

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THE ANNUAL MEETING, 1911
(*Continued*).

The Scientific Department.

Going back to the proceedings on the Second Day (August 29, 1911) the following speech by Mr. C. Danvers (North Mysore) may be quoted :—

MR. DANVERS said

MR. CHAIRMAN AND GENTLEMEN,—As you have all heard, a proposal has emanated from the North Mysore Association that a Scientific Department should be formed, with trained Assistants in each District, under Mr. Anstead as Chief Director. This proposal was brought forward by Mr. C. H. Browne, a planter of light and leading, in a speech which I think everyone has seen, and which has just been read by the Chairman, and was immediately adopted by all the intelligence of Mysore. It may be because Mysore is one of the oldest planting Districts, and so has had more time than some others to develop problems ; but I am proud to think that Mysore has always been to the fore in seeking the aid of science, and I am proud to be able to state to-day, that Mysore has completed its arrangements for the employment of an Assistant to Mr. Anstead, details of which will be laid before you later on. One other Association, the Malabar Coast, appears to have also grasped the greatness of the idea, and risen to the occasion—and I congratulate it on a wise and momentous decision. I am not clear, however, as to whether it is running its Assistant "on its own," or whether it intends to be incorporated with the Scientific Department that we of Mysore hope to see inaugurated at this Meeting.

It would be a work of supererogation to descant at this late hour on the advantages of scientific help in agriculture or planting. Their experience of its value is daily acknowledged by American farmers, and in parts of Europe agriculture has been practically saved from extinction by science. The appreciation of scientific aid by the planters of the West Indies and by our go-ahead brothers in Ceylon, and the grateful acknowledgments of tea planters in Northern India, all speak more eloquently of its value than any words of mine could do. We, too, have secured the services of a Planting Expert. I will, therefore, leave the plainly obvious to take care of itself, and will pass on to what should be, but does not appear to be, equally obvious to all—and that is the necessity of the full application of the principle to ourselves. I do not for a moment mean to say that any District does not appreciate the value of our Scientific Officer—far from it. The enormous increase of correspondence with him, and the general demand for visits

from him, show the widespread appreciation of him that exists. And that brings me to my point, which is that we are wasting him, inasmuch as we do not get his full value from him, and we will shortly either kill him or lose him. For the last two years he has been kept on the move in all directions, and can have had little of either physical or mental rest. Perhaps it has been right that he should have gone to and fro, and up and down, learning his country and his—man. Some one said of the British that each islander was an island in himself, and if you add that each of these islanders lives on an island by himself, you get somewhere near the average South Indian planter. Such an individual takes learning: he has his qualities and the defects of his qualities; and, as I said, it is, perhaps, as well that the last two years have been spent as they have been. But the time has come for a change, and instead of killing our Scientific Officer, or otherwise losing him, we must supplement him by trained Assistants. We have at present a man who does not spare himself, and we must spare him. We are wasting him, I repeat. We have a brain and a keenness at our disposal that should be now employed doing something worthy of both, and that should not be allowed to waste time in trains or rust in bullock carts. We have also a laboratory, obtained with vast trouble, though at small cost, which likewise must be greatly wasted if things are not altered; again, we may kill our man, driving the willing horse to death; but I am not so apprehensive of that, as I think we are more likely to lose him after wasting him. Our Scientific Officer belongs to the Government of India, and that Government may very well say at the end of this present term :—"We lent the planters of South India a man with a brain and they have mainly used his legs. We have cast our pearls before swine, and we will gather them up again."

Another point that we must consider is this. Neither our present nor any succeeding Scientific Officer can be considered as a machine which we have bought with our money to let lie till it rust, or work till it bursts. He is, and any successor will be, a man with at least average ambition; and you cannot expect to retain knowledge, brain and keenness unless you make it worth while to the possessor of these qualities. No man who feels that he is fitted for higher flights will remain contentedly jogging along railway tracks and bandy roads, nor will any one with a turn for research work, contentedly spend his life answering questions which any student of the scientific A, B, C could do. We must give the head of our Scientific Department work to do that will be worthy both of him and of ourselves. We must provide an Assistant to that head who will take the road work and the spade work off his hands, and who will always be at hand to guide us and advise us and jog our elbows. I lay great store by that same jogging of our elbows. Dr. Lehmann used to say:—"What you need is experiment, and experiment, and experiment." But, though often enthusiastic in company, when we, islanders, get back to our islands the glow of enthusiasm is apt to fade and the experiments are either not made or made half-heartedly. Then should our elbows be jogged. And who is to do it but the Assistant Scientific Officer we should have always with us? A little bird once whispered to me that certain people said :—"If the Mysore men want an Assistant Scientist, let them have one, it will give us more of Anstead." No greater mistake could possibly be made. I will personally guarantee that the equivalent of any time which the Planting Expert has devoted to Mysore in the past will be more than filled up with Mysore affairs in the future. We have recognised this ourselves by budgeting for increased office expenses on account of the anticipated increase of work.

I will not use any further arguments, for Mr. Anstead has put forward many, and in much stronger words, in the various references he has made to

the scheme, and I think I have said enough to show the views of the Mysore Associations; but I will repeat my congratulations to those who have grasped and given form to the great and momentous idea, and I appeal to those who have not yet done so to think again. Let them look upon scientific aid as an investment, likely, if we may take universal experience as a guide, to bring in a large return. The capital needed is very small, the dividends are likely to make the most flourishing Rubber Company envious. Let them look upon it also as a policy of insurance against possible diseases, the returns on which are impossible to estimate, and the value of which to us we may never know. Let those once threatened with "pink disease" imagine the possible loss had not an expert been at hand to check its advance. Let them take pencil in hand, and give on one side the cost of the Scientific Officer to them, and on the other side the possible loss if the disease had been allowed a free course. Let them also think whether a further small increase in the cost of the Scientific Department will not be a wise and profitable investment, combining as it will the advantages of both field and laboratory work. We have reached a point where we are to a great extent wasting our expert, wasting our laboratory, and wasting our money. We have laid the foundations only of a Department which at its present stage of development is—I will not say inefficient, for I would not like to use that word in even remote connection with our expert—but which is insufficiently efficient; and we must go forward or fail. Some Governments support such Departments entirely; but we live under those that enact the part of Providence only to the extent of helping those who help themselves. We must go forward or fail. Failure is unthinkable, and I hope that soon we shall be united in building up a Scientific Department which will be worthy of its head, worthy of ourselves, and worthy of representing the great and growing planting industry of Southern India.

The following Resolution was proposed by Mr. F. M. Hamilton, seconded by Mr. P. G. Tipping:—

"That as the Mysore Associations have united together to supply the United Planters Association with funds to supply an Assistant to Mr. Anstead on the lines of the scheme laid down by the late Mr. R. D. Tipping, other Associations connected with the United Planters' Association be asked to make every endeavour to follow suit."

Mr. TIPPING, in seconding the Resolution, said that, as the delegate from Coorg, he had come down to support Mysore as regards Block 1 of the scheme of the late Chairman. He was very pleased to find that Mysore had taken such a strong lead by deciding to have an Assistant of their own. He still hoped, however, that it would be found possible, too, for Coorg and Mysore to amalgamate. He came to the Meeting prepared on behalf of the Coorg Association to support the Mysore scheme up to one-half of the amount of the money required, but if this could not be done, he hoped to go back and put the matter before the members of his Association and try and get an Assistant of their own. If this was not possible he trusted that a way would still be found by which they could amalgamate with Block 1. They heartily supported the scheme for giving assistance to Mr. Anstead.

Quality and Curing of Coffee.

Speaking on this subject, Mr. R. D. ANSTEAD, B.A., said:—

During the past year I have gone a little into this vexed subject, and paid a visit to the Curing Works, at Hunsur, and at Coimbatore. As far as the machinery in use is concerned I have little or nothing to suggest. The curers are of the opinion that this machinery cannot be improved, but are quite ready to discuss suggested improvements, which, however, the planters

do not submit to them. It is possible that a slight alteration might be made with advantage in the edge runner by perforating the trough holding the coffee so that the pulverised parchment could fall through instead of accumulating as it does at present and being rubbed into the surface of the bean. It is suggested that this is one way in which beans lose colour, and it appears to be those which are not sufficiently dry which suffer most.

This leads up to what in my opinion is the crux of the whole matter, the drying on the estate. The coffee as sent to the coast is unequally dried, bean for bean. This I proved by taking beans haphazard from a bushel of coffee which was reported dry on the estate drying ground, and which weighed 31 lbs. There was a difference of as much as 14% in the moisture content between the wettest and the driest bean picked out.

The method of sun drying at present usually adopted is not conducive to even drying. Unless the parchment is spread in very thin layers, and constantly turned over, it cannot dry evenly. I suggest that in the old days, when labour was more plentiful, and Coffee a higher price, more trouble was taken about drying on the estates, and thus a better quality was obtained.

The remedy appears to me to be to instal artificial dryers on the estates. The cost of a suitable dryer to handle two tons of wet parchment at a time is about £230. A large amount of labour will be saved on the drying ground, and all experiments on a small scale with artificially dried coffee point to improved quality and price, so that the cost of the machine would probably be covered in course of a very few years.

Other things besides drying affect the quality, however, and one is the presence on many coffee estates of patches, totalling up to a big acreage in the aggregate, of poor trees suffering from old age, borer, or stump rot, or a combination of these, which yield a poor, low grade sample of Coffee.

The crop from these patches should undoubtedly be picked separately, and never mixed with the bulk sample from the estate. I would suggest that it should be sold locally in the cherry.

Again, I feel sure that it would pay to grade the cherries before they are pulped, and pulp small and large ones separately so as to avoid the high percentage of pulper-bruised beans that are often to be found in the finished sample.

Attention to these points will, I think, improve the quality at least a little, but it is probably better to aim at big yields rather than high quality, and for this purpose work upon Hybrids should be pushed on as rapidly as possible.

There is one more point which is worth careful consideration. It is a common experience among fruit growers in the Tropics that fruit does not set, and that the crop is out of all proportion to the show of blossom. Mr. C. Drieberg dealt with this matter in a Paper read before a Meeting of the Ceylon Board of Agriculture last April, and made some remarks which are worth carefully thinking about by Coffee planters. In the course of his address he said :—

"The work of insects in the pollination of flowers is not appreciated in this country. Bees, moths, wasps, and ants all assist in carrying pollen from flower to flower. Of all these, the bee is, of course, of the first importance. The position in which nectar is stored is such as to bring the body of the bee seeking it in contact with both stamens and pistil, so that pollen grains sticking to the hairs on the body of the bee are distributed as the bee flits from flower to flower, gathering both honey and bee-bread. 'The use-

fulness and importance of the bee,' says a writer on the subject, 'can hardly be overestimated; and successful orchard practice will never result until the work of the bee is recognised practically by the establishment of bee colonies in every orchard district.'

"It is often said that wet weather at the time of flowering is followed by a reduction in the crop owing to rain washing off the pollen. This, according to reliable observers, requires further evidence, and the cause of non-setting is rather to be attributed to the fact that bees and other insects are prevented from paying regular visits to flowers under rainy condition.

"There is no reason whatever why everyone who is cultivating fruit-producing crops should not keep a few hives of bees. Bee-keeping, apart from its value in aiding in fertilization, is one of the pleasantest hobbies, and in indulging in it one can always rely upon securing a supply of pure honey for his table."

Darwin's historic work proved that self-fertilization tends to weaken the resultant offspring; I think that it is more than possible that self-fertilization may reduce the quality of the coffee bean. That our Coffee is largely self-fertilized there can be no doubt, and I understand that the number of bees to be found on the coffee estates in general has, for one reason and another, been reduced during the last 20 years.

I suggest that it is well worth while to try the effect of bee keeping in connection with coffee. Honey and beeswax fetch fair prices in India, and the industry should, in any case, prove a self supporting one, and the effect, upon the quality of the coffee, should there be any, would soon make itself apparent.

We are still ignorant as to what the quality of coffee is due to. During the year an important paper appeared in the *Lancet* dealing with the chemistry of Tea and pointing to quality being due to the presence of Caffeine and Tannin in the right proportions to form a chemical compound, Caffeine tannate.

This certainly suggests a similar line of research upon Coffee, and it is one which I should like to follow up, given time to do so.

Finance Committee.

On the third day it was decided, on a motion from the Chair, that the Finance Committee and the Committee of the S. I. P. B. F. should consist of the Planting Member of Council, the Chairman of the U. P. A. S. I. and the Senior Vice-Chairman, with the Secretary as *ex-officio* Member.

THIRD DAY—AUGUST 30, 1911.

Sectional Meetings.

In connection with the Rules of the Association the following Resolution was proposed by Mr. C. Danvers and seconded by Mr. E. F. Barber:—
"That as, in the opinion of this Association, the long intervals between the Meetings of the U. P. A. S. I. result in loss of interest in and knowledge of current subjects and with a view to expediting the transaction of business of importance it is desirable that half-yearly meetings should be held."

Mr. ANSTEAD, the Planting Expert, in proposing an amendment, said:—

I think that the Resolution before the Meeting will not find favour with the Delegates, and that it is likely to be rejected. Though not feasible, the idea embodied in the Resolution is a good one, and I have long felt that we do not get together often enough. I beg therefore to propose the following amendment (see Resolution 26, page 556).

In proposing this Amendment I would point out that at the Annual Meetings of the U. P. A. S. I. it is seldom that more than two delegates from each district are present, often only one, and there are so many subjects of a businesslike nature that must perforce be discussed that agricultural matters pure and simple are apt to be crowded out.

Could we have Sectional Meetings such as I propose both these difficulties would be got over. In the first place, if the time of year at which the meeting was held, and the place, were carefully considered it should be an easy matter to get a number of men together, all interested in the same subject, and there would be little need to discuss planting politics and agriculture could assume the foremost place.

I would suggest, for instance, that a meeting be held at a centre like Hassan, at which those more directly interested in Coffee and Ceará Rubber would attend from Mysore and Coorg, while the Tea districts would probably not be interested and it would not much matter if they were unable to send deligates, since little but Coffee and Ceará would be discussed, together with business matters relating more particularly to Mysore and Coorg. The same would apply to a Meeting at a centre in the Tea districts, and another in the Hevea Rubber districts. At these latter, Tea and Hevea respectively would be the chief items on the Agenda Paper.

I think that we are all agreed that it is a good thing, and a progressive thing, to get together occasionally and exchange experiences and discuss mutual difficulties. Sectional Meetings would afford, too, excellent opportunities for discussing and thrashing out proposals referred back to the District Associations at the Annual Meetings, and conclusions would be more likely to be arrived at than under the present system, since at Sectional Meetings more than one district would be represented, and represented by free agents instead of delegates necessarily more or less tied down by the instructions they have been given by their Associations.

Thus it seems to me that not only would progress be made by discussing agricultural matters but time would be saved, and business more expeditiously done at the Annual Meetings, because delegates would come here with proposals which had already been to a great extent thrashed out and agreed upon at the Sectional Meetings.

With regard to the last paragraph of my Amendment I need say little. I take it that we are all agreed that the presence of our able Secretary is necessary at such meetings if they are to be a success; his presence indeed will go far to ensuring their success.

My Amendment is seconded by Mr. Playfair, the delegate for South Mysore, and I hope that it will find support amongst the other Delegates present.

Vote of Thanks to the Chairman.

MR. DANDISON moved a vote of thanks to the Chairman in the following speech:—

GENTLEMEN.—It has fallen to my lot to have the honour and pleasure of proposing a very hearty vote of thanks to our Chairman. I may say this is the first time I have attended a U. P. A. S. I. Meeting, and, as this is an honour I did not expect, I hope you will forgive me if I do not do justice to the occasion. I had no idea of the amount of work this Meeting entails, and if so much falls to a delegate's lot, how much more to the Chairman, both before and during the course of this Meeting? I am sure you will all agree with me that the Hon'ble Mr. Hamilton has most ably dealt with all matters, and has helped us in our difficulties. To put it concisely, he has

conducted this Meeting in a truly masterly manner. I therefore, have great pleasure in proposing a most hearty vote of thanks to the Chair.

The Chairman's Closing Address.

The CHAIRMAN, replying, said that Mr. Dandison, he was afraid, had rather exaggerated anything that he might have been able to do in regard to the work of the Meeting. The proceedings had been long and, perhaps, a little tedious, but his duties had been very light, owing to the care and courtesy of the delegates. There had never been the slightest difficulty at all in conducting the debates. He might have hinted occasionally that the discussions were becoming too discursive, but it had been generally considered that, meeting as they did only once a year, some allowance had to be made. With regard to work before the Meeting, very little had fallen to his share, much of the work being taken off his hands by Mr. Ormerod and Mr. Anstead. But he was glad indeed to hear a new delegate declare that he had no idea what an amount of work was thrown on the Chairman. Mr. Abbott had no easy task before him, and he was glad when this was recognised. He thanked Mr. Dandison and the delegates very cordially for their vote of thanks.

They had had rather important matters before them at the Meeting. The financial position was not as firm as it should be. As a very large proportion of the general expenditure was directly due to the Scientific Department, it was only right that the increase in the funds of that Department should pay for the increased cost of the general work. Thus the General Fund had been placed on a more sound footing. He expressed the hope that, during the coming year, a little more attention would be paid to financial considerations, and the devising of some means of pulling all straight again. They had, as he had said, commenced the organisation of the Scientific Department, and he trusted that he was not going beyond his province as Chairman if he ventured to give them a little advice and expressed his opinion. Mr. Danvers and his colleagues in Mysore had, in a gallant manner, raised the money required for a Scientific Assistant, but, as far as he knew, they had not secured any surplus. He hoped that a way might yet be found to include Coorg in that scheme. It was very much more easy to expand a scheme than to contract it, and, speaking independently of his position as a Mysore man, he would like to see the scheme started with an overflowing cash box. He believed that in a very short time they would decide to separate, and that the Bababudins and North Mysore would raise the money to have a man for themselves, and that South Mysore and Coorg would do the same. They all thought and felt that it would be better to join forces for a year or two and work together. They in Mysore had started the whole thing. They knew their man, and he was certain that never a word would be said against him or the work that he had done for them during the past year; but as they had overworked him, they had decided to give him the relief that was so absolutely necessary, and he trusted that the other Districts would during the year be able to devise schemes on the same lines. He trusted that the delegates would not think that he was dictating to them, but it was a scheme in which he took a very great interest. He had discussed it with men at the Meeting and with others outside, and if he had formed strong opinions on the subject, he felt that he should be allowed to express them.

They had also started an experimental plot and in regard to this he wished to express his appreciation of the sporting spirit which actuated Wynaad and South Travancore, though they had no direct interest in the scheme, to subscribe for the help of those who were interested.

With regard to the *Planters' Chronicle*, he had very little to say; but it was very satisfactory that their discussion on the subject generally pointed to the fact that it was considered a valuable asset, and not a thing to be lightly thrown about.

He had been asked for a ruling as to the duties of Honorary Secretaries of District Associations as regards the Planters' Benevolent Fund. He was not in a position to lay down the law, and he did not wish to do so, but he thought he might say that Honorary Secretaries should do their best for the Fund and for its subscribers. He trusted that Honorary Secretaries, being as they were in charge of the welfare of all planters in their Districts, would add to their duties by endeavouring to collect subscriptions and remind planters that their subscriptions were due.

He had now the pleasant task to express his thanks to the several gentlemen whose work had contributed to the success of the Meeting. Mr. Anstead was one of themselves and did not get full thanks but he was sure that all would agree that he deserved the best thanks of all for what he had done. He (the Chairman) had a little personal experience of what Mr. Anstead had done. He had been in Bangalore for about ten days, and during all that time he had seen Mr. Anstead hard at work. Mr. Ormerod had made his duties very light by getting everything into order under great pressure, and in spite of the confusion and anxiety consequent on the recent changes, had piloted them through this Meeting to the end. He desired to thank the Press for all that it had done to them and, finally, he desired to thank his old friend, the official reporter (Mr. Bremner) whom he was glad to see at the Meeting again.

He then declared the Meeting closed.

Addendum.

The Chairman of the United Planters Association of Southern India, wishes to express his great regret that in his closing speech, referring to the Mysore Scientific Assistant scheme, he forgot to state that the Coorg delegates had officially informed him that if Coorg were admitted to participate in the scheme, it would subscribe to the United Planters' Association on the full acreage basis.

Office-bearers, 1911-12.

It should be explained with reference to the results noted in last week's issue, that the ballot returns showed a majority in favour of Mr. E. F. Barber as First Vice-Chairman, and Mr. Charles Danvers as Second Vice-Chairman; but upon the latter gentleman declaring his inability to undertake any executive work in connection with the Association this year, Mr. Aylmer Ff. Martin (in whose favour the next largest number of votes were recorded) was appointed.

Scientific Bulletins.

It may be mentioned here that during the course of the Meeting it was resolved in Committee :—

"That the Editor of the *Planters' Chronicle* be requested to edit and revise with the assistance of the Scientific Officer the papers contributed by the latter to the *Planters' Chronicle* and have selected papers published and sold as Bulletins, each dealing with one subject."

Arrangements for the issue of these U. P. A. S. I. Bulletins will be made in due course, the intention being that all papers dealing with particular subjects should be brought together, revised, and either amplified or condensed, as circumstances may seem to require.

Memo. of Resolutions.

THE SCIENTIFIC OFFICER.

1. That the Scientific Officer be permitted to move Resolutions at the Meetings of the U. P. A. S. I. but not to vote.—Carried.

WEIGHTS AND MEASURES.

2. That last year's resolution on the subject of Weights and Measures be re-affirmed, *viz*: That this Association, realising that the Madras Government have done all that is reasonable for the present on the subject of Standardization of Measures, now urge upon the Government of India the necessity for the Standardization of Weights throughout the country. —Carried unanimously.

AHTUR GHAT ROAD.

3. That Government be requested to state definitely their intentions with regard to this road, in order that the estates interested may know if they must take other steps for making an outlet for their produce.—Carried *nem. con.*

THE VAIGAY VALLEY RAILWAY PROJECT.

4. That last year's resolution be re-affirmed on the subject of the Vaigay Valley Railway (see page 85, U. P. A. S. I. Proceedings, 1910, at foot) and that the Madura District Board be again addressed, as the terms of the Agreement between the Secretary of State and the S. I. R. are now known. —Carried.

RAILWAY TO THE WEST COAST.

4. That this Association once more draw the attention of the Government of India to the want of direct Railway connection between Mysore State and the West Coast and views with concern and alarm the fact that the terms of the new agreement about to be made with the South Indian Railway, will debar private enterprise from undertaking one of the quickest and surest means of adding to the wealth and economical progress of the country.—Carried unanimously.

UPKEEP OF GHAT ROADS.

6. That the Government of Madras be asked to undertake the upkeep of all ghât roads leading to planting districts out of Provincial Funds. —Carried *nem. con.*

THE SCIENTIFIC DEPARTMENT.

7. That, as the Mysore Associations have united together to supply the U. P. A. with funds to employ an assistant to Mr. Anstead on the lines of the scheme laid down by the late Mr. R. D. Tipping, the other Associations connected with the U. P. A. be asked to make every endeavour to follow suit.—Carried.

SCIENTIFIC OFFICER'S TOURS.

8. That when an Association requires the services of Mr. Anstead, at least a month or 6 weeks notice be given beforehand to the Chairman, through the Secretary, U. P. A. S. I., to enable him to consult with Mr. Anstead and arrange for a tour in the district requiring the Scientific Officer, and that should more than one district desire his presence at the same time, the one whose application was first received in the office should have the preference.—Carried.

9. That Honorary Secretaries be in no way bound to offer to make arrangements for the Scientific Officer to visit non-members or to guarantee that such visits shall be made, but should a non-member who has subscribed to the Scientific Officer Fund intimate to an Honorary Secretary that he desires a visit it is, in the opinion of this meeting, the duty of that Honorary Secretary to consider his request on its merits.—Carried.

IMPERIAL PREFERENTIAL TARIFF.

10. That this Association do confirm last year's resolution on an Imperial Preferential Tariff.—Carried.

EXPORT OF MANURES.

11. That negotiations be entered into with the principal suppliers of manures, directed towards ascertaining the best means of discouraging the export of manures from India and of encouraging the manufacture of super-phosphates, and that on sufficient information having been gleaned, and in view of the increased demand for, and increasing prices of, both bone and oilcakes for manurial purposes in Southern India, and in view of the discouragement of Government's own efforts to induce agriculturists to adopt and extend the use of these fertilizers by the difficulty and cost of obtaining them, the Secretary do write to the Government of Madras asking them to give this matter their sympathetic consideration, and to recommend to the Government of India the placing of an export duty on both articles, and so supplement the helpful attitude the Supreme Government has already assumed by exempting all manures from the Import Duty leviable under the Indian Tariff Act.—Carried.

HYBRIDISATION OF COFFEE.

12. That on the understanding that the following Associations do guarantee the payment of their share of the cost up to a maximum of the amounts hereinunder written against their names, the Secretary of the U. P. A. S. I. should be, and hereby is, empowered to enter into definite negotiations with the Government of Madras for commencing operations on the Nilgiri Experimental plot for Hybridisation :—

Nilgiri P. A. ...	...	...	Rs. 100
North Mysore P. A.	...	...	,, 100
Coorg P. A. ...	...	...	,, 100
South Mysore P. A.	...	...	,, 75
Bababudin P. A	...	...	,, 50
Shevaroy P. A.	...	...	,, 50
			Rs. 475.

—Carried.

BEES IN PLANTING DISTRICTS.

13. That Government be asked, through the U. P. A. S. I., to pass some rule prohibiting the destruction of bees in planting districts.

BONUS ON GREEN TEA.

14. That the U. P. A. S. I. approach the Indian Tea Cess Committee and request that a bonus of 6 pies per lb. on 4 million lbs. of green tea to be exported from Southern India Tea Districts, may be granted from the Committee's funds, in order to encourage what it may be reasonably hoped will become a self-supporting and expanding industry in the near future. —Carried.

(The above was carried after rejection of the following proposed amendment :—

"That this Association considers that the present state of the market for all classes of Tea, does not necessitate the reintroduction of a bonus on Green Teas; but it is of the opinion that it would be advisable to approach the Indian Tea Cess Committee to allot an equivalent sum of money for the pushing of Indian Black and pure uncoloured green teas side by side in America and considers that the time is now ripe for a vigorous advertising campaign."

THE S. I. P. B. F.

15. That a voucher from the Honorary Secretary to the Fund be issued to all subscribers to the P. B. Fund.—Carried.

16. That the Financial Year of the P. B. F. be the same as that of the U. P. A. S. I., *viz.* from 1st July to 30th June.—Carried.

17. That the warm thanks of the Association be tendered to Messrs. T. H. Allan & Co., of London, for the kind services they rendered in collecting donations to the S. I. P. B. F.—Carried.

THE LABOUR PROBLEM.

18. That the Delegates from Kanan Devan and the Anamalais be asked to form a Committee to consider the labour problem and the best means of meeting it, taking care to consider the various views and conditions of different districts, and with a view to reconciling as far as possible conflicting opinions.—Carried unanimously.

RECRUITING AND EMIGRATION.

19. That this Association deprecates the action of the Ceylon Labour Commission in establishing Cooly Recruiting Agencies in the vicinity of old established estates, and trusts that all such agencies may be withdrawn. —Carried.

20. That the attention of the Ceylon Labour Commissioner be called to the fact that his agents are actually trying to crimp advanced coolies on the estates in our districts, and that we record our opinion that such action is certainly dishonest and probably illegal.—Carried.

(The above was carried in place of the proposition originally moved, which read as follows:—

"That the U. P. A. S. I. ask Government whether some rule might be adopted to prevent recruiters crimping in a planting district.")

NON-EXECUTION OF WARRANTS.

21. That this Association again call attention to the non-execution of warrants issued under Act XIII of 1859 and Act I of 1903 and while thanking the Governments of Madras and Mysore for what they have already done, records its opinion that little improvement has as yet occurred and would ask them to take further action in the matter, especially with reference to the suggestion of the D. S. P. of the Nilgiris, that a register be established for recording the history of all warrants.—Carried.

CIRCULARS.

22. That the U. P. A. S. I. get printed as many circulars as required by the daughter Associations for broadcast circulation among the villages of South India.—Carried.

THE "PLANTERS' CHRONICLE."

23. That the subscription to the *Planters' Chronicle* be fixed at 8 as. per copy or Rs.20 per annum.—Carried.

24. That this Meeting is of opinion that gentlemen who are not members of a District Association are not entitled to copies of the *Planters' Chronicle* free.—Carried.

THE SCIENTIFIC DEPARTMENT.

25. That the U. P. A. S. I. be asked to receive the contributions of the united Mysore Associations, *viz.*, North and South Mysore and Bababudin, to be disbursed on behalf of those Associations on account of the proposed Assistant Scientific Officer: and that on receipt of suitable guarantees the Chairman and the Scientific Officer be hereby empowered to secure the services of such an assistant.—Carried.

SECTIONAL MEETINGS.

26. That meetings of the United Planters' Associations of Southern India be held annually as heretofore, but

(1.) That at least three subsidiary Sectional Meetings at convenient centres be held in addition each year to deal mainly with Coffee, Tea, and Rubber, respectively.

(2.) That these Sectional Meetings devote special attention to the purely agricultural aspect of the planting industries by means of lectures, exhibitions, and discussions.

(3.) That all Resolutions passed at these Sectional Meetings shall be forwarded to the U.P.A.S.I. to be reconsidered at the next Annual Meeting of that body, and that such Resolutions shall not become in any way binding upon the U. P. A. S. I. unless re-affirmed at an Annual Meeting.

(4.) That the Secretary of the U. P. A. S. I. be hereby empowered and instructed to approach the Honorary Secretaries of the District Planters' Associations with a view to making the necessary arrangements for holding such Sectional Meetings during the ensuing year, and in future years; that he shall attend all such meetings, if possible; and that a Travelling Allowance shall be granted to him for this purpose, of a double first-class railway fare and Rs.5 halting allowance.—Carried.

(The above was brought forward as an amendment to the following proposition, which became void on the adoption of the amendment:—

"That as in the opinion of this Association the long intervals between the Meetings of the U. P. A. S. I. result in a loss of interest in and knowledge of current subjects, and with a view to expediting the transaction of business of importance, it is desirable that Half-yearly Meetings should be held.")

RULES.

27. *Rule V.*—That for "Vice-Chairman" the word "Vice-Chairmen" be substituted.—Carried.

28. That the following be added to Rule V:—"That the Scientific Officer shall be permitted to move Resolutions at Meetings, but shall have no vote."—Carried.

29. *Rule VI.*—That for "Vice-Chairman" the words "two Vice-Chairmen" be substituted.—Carried.

30. That the following be added to Rule VI: "That should a vacancy occur in either of the appointments of Vice-Chairman during any financial year at any time greater than one month from the expiry thereof the Council shall elect one of their number to fill such vacancy."—Carried.

31. That in view of the Association's financial position the Secretary be asked to circularize Honorary Secretaries pointing out the urgent need for funds in order to enable the work of the U. P. A. S. I. to be carried on properly, and requesting those districts that are able to do so and have not joined the Scientific Officer's Assistants fund to pay a subscription at 2 annas per acre to cover all expenses.—Carried.

FINANCE.

F/1. That the Secretary be, and is hereby, authorised to utilise temporarily for general expenditure a portion of the Reserve Fund, not exceeding Rupees one thousand, any moneys so used to be replaced in the Reserve Fund and invested in fixed deposit as soon as this can be done with safety. —Carried.

F/2. That an appropriation be temporarily made from the Reserve Fund to meet any expenses in connection with the advertisement scheme

to be subsequently recovered from District Associations purchasing the advertisement circulars.—Carried.

F/3. That Mr. Anstead be instructed to attend the Dasara Exhibition in Mysore, and that Rs.200 be taken out of the available Rubber Exhibition funds and applied to the expenditure incidental to the showing of exhibits sent on from the U. P. A. S. I. Exhibition.—Carried.

The U. P. A. S. I. Exhibition

AND AN UNVEILING CEREMONY.

In connection with this year's Exhibition an interesting little unveiling ceremony was performed by Mrs. J. G. Hamilton, who kindly opened the "Picture Gallery" of the Association, which has been started with the portraits of Messrs. George Romilly, H. P. Hodgson, and J. A. Harris, all ex-Chairmen, and the two first also formerly Planting Members of Council.

The "veil" had been very effectively arranged by Mr. R. D. Anstead, B. A., and in due course it fell gracefully away and revealed the "counterfeit presentments" of three stalwart champions of the planting industry of South India.

The Hon'ble Mr. J. G. HAMILTON first addressed those assembled in the following terms:—

"We have met here to-day to do honour to past leaders of our community, and to inaugurate the U. P. A. Gallery. The trio, whose portraits we are soon to look on, are all old personal friends of mine, so anything I may say of them can be called tainted with prejudice; at the same time so many others have appreciated their work openly, that I feel no hesitation in holding them up as examples to present and coming Delegates and Officers.

"Only the other day, when parting from one of them, we listened to a speech from him which should have been reported and published, and I am glad of an opportunity of trying to repeat some of his words to you. Speaking of the passage of time he warned younger men that they must not rely on the older ones to carry on their business for ever, he asked them to take a greater and earlier interest in Planting Politics and train themselves in Local Associations for work in a larger sphere which must lie before some of them eventually if we are to maintain the U. P. A. and all it means. This advice I most strongly approve of; it deals with a point which has struck me very forcibly during the past year. It takes this Meeting to make me an equal first with Mr. Hodgson in the matter of attendances, but it seems to me that I am the only one left, who can be called an original delegate, still in active service. One by one we are dropping off, and every man who retires to "skulk on hilltops," or goes home, has to be replaced, and every year we must expect to lose some by one means or the other. Even in the way of Meetings, we don't want to see any more like those in 1903—5, when less than a dozen turned up, but beyond that there is the far more important question of the work through the year. I can tell you, as other Chairmen have told me, that there are times when your executive feel in despair, when they cannot get help or advice from anyone, when Honorary Secretaries in District Associations report the same state of things locally, and when everyone wonders why the U. P. A. does nothing and grumbles if it does anything. The responsibility for this and the responsibility for finding means of remedying it lies and must always lie with the general body, and I hope that all who come here will lose no opportunity of impressing this fact on all others and of interesting any comparatively young and untried men who show any talent or energy. Please never forget that we must have Planters to help us. You may give us officers, you may give us a staff; but unless you

turn to and give us help yourselves, we can scarcely fail to get into a groove, so I will give you a bit of advice to take back and cram down the throats of grumblers, of one kind anyhow, and it is this: 'Don't call Associations one horse shows when you yourself shy at the very smell of harness.'

For our Gallery we still lack one or two portraits of men who are no longer with us, but who should adorn these walls. I hope that we may get them some day, but at the same time I hope that it will not become a fixed idea that everyone who puts in a spell of work, either locally or centrally, is entitled to the honour; let it be kept a high honour by refusing entrance to all but those who have really earned a right. Those who have done a minor share of work, a share which in itself demands a considerable sacrifice of time and trouble when one considers our distances and want of transport facilities, I mean those who attend our meetings, will all I hope have a certain amount of honour, *viz.*—appearing in the group photos. which have now become an annual part of our proceedings. I have kept you a long time and have now only to ask the wife of the Planting Member to withdraw the veil from the faces of our friends.—(Loud applause).

The Chairman then asked Mrs. Hamilton to unveil the portraits. Mrs. Hamilton performed this ceremony, and then declared the Exhibition open.

This year's display was decidedly more varied than last year's, and better arranged. The laboratory premises being now occupied, the exhibits were displayed in the general office. They attracted a fair number of visitors and aroused no little interest. Mr. G. H. Krumbiegel, Economic Botanist and Superintendent of Government Gardens, Mysore, had kindly lent some show cases, as well as a number of eucalyptus and leguminous plants in pots, a few herbarium drawings and an exhibit or two. Messrs. Peirce, Leslie & Co., Ltd., contributed, not only a fine array of fertilisers, &c., in bottles, but also some tapping knives, and other implements which made up quite an attractive "trophy" on one of the walls. Messrs. Parry & Co., of Madras, also showed an excellently arranged series of specimens of artificial fertilisers.

Some of the exhibits of products may be mentioned, though a complete list would occupy more space than can be afforded.

CARDAMOMS.

There were specimens from Oossoor Estate (South Mysore—Mr. W. L. Crawford); "Glen Peak" (Shevaroys, Mr. R. A. Gilby); Mavinkere (North Mysore, Mr. W. H. Reed); Aglatti (South Mysore, Mr. J. B. Russell) and Chundrapore (South Mysore, Hon'ble Mr. J. G. Hamilton).

Bleached, hot-air dried, sun-dried and unbleached specimens were shown, as well as seed.

COFFEE.

Messrs. J. G. and F. M. Hamilton (South Mysore) exhibited the Arabian-Bassanhalli kind, uncured cherry, pounded and foxy; and the Arabian-Coorg kind, parchment, pounded, and uncured; also Liberian, in the cherry uncured and pounded.

Very noticeable specimens were Mr. F. M. Hamilton's Golden Drop-pounded cherry, and cherry.

Messrs. Matheson's Works, Hunsur, sent a nice range of "A" size and Peaberry, besides a good show of Tinned Coffee. Mr. E. E. Williams sent from the distant Kanan Devan District fine samples of Parchment, from two estates, ranging from P. B. and O. to Triage. From Coorg, Mr. J. A. Graham contributed Coffee A and B. from three estates. Mr. F. D. H. Short, Swinton Estate, Shevaroys, exhibited six varieties in a neat case. Peaberry

and other sorts were sent in by Mr. W. L. Crawford, from South Mysore. Another contribution by Messrs. Matheson's Works comprised Parchment No. 1, Bold 2nd Grade, Extra Bold, Ordinary Common, Cherry B, Finest Peaberry, and Cherry Triage and Peaberry.

Hybrid Coffee, valued at 90 shillings per cwt., was Mr. E. W. Fowke's interesting display. There was, too, a second case of Shevaroy Coffee (P. B., A. B. C. T. and Powder) with attractive photographs, from Mr. Chas. Dickins, of "Arcadia," Nagalur.

Mr. E. M. Breithaupt, of Poliibetta, included in one case samples of Coffees, Black and White Pepper, Vanilla Beans, and these beans prepared for the London market; and the Scientific Department of the U. P. A. S. I. added a small quantity of *Coffea stenophylla* to the show.

PEPPER.

Besides Mr. Breithaupt's samples, already mentioned, there were White Pepper from Messrs. J. G. & F. M. Hamilton, and White and Black Peppers from Mr. E. M. Playfair (South Mysore).

RUBBER.

Some of the exhibits were very fine. The display comprised Ceará Biscuits from South Travancore, Sheet from Mundakayam, Guayule from Mexico (kindly lent by the Economic Botanist to the Government of Mysore) and Borneo Block, from the East Indies Crude Rubber Trading Co., London, *per* Mr. Stuart R. Cope, of that city.

Hevea.—Scrap Mud Rubber, Scrap No 2 and No. 1, Worm Rubber, No. 1 Blanket Crepe, No. 2 Crepe, No. 1 Thin Crepe, No. 2 Crepe, all from Mr. H. B. Kirk, of the Periyar Rubber Co., Ltd., Cochin. Smoked Pará Sheet from trees 5 years old (Mooply Valley Rubber Co., Palapilly, Cochin). Thin Crepe from the Periyar Rubber Co., Pará Biscuits and Hand-made Biscuits (Poonmudi Tea and Produce Co., Ltd., Travancore).

Rubber Seeds—Ceará and Hevea—were also included in the collection. Mr. H. B. Kirk's display was very instructive, as it comprised hopelessly bad seed, seed in the pod that had dropped off without ripening and crushing the pod, special selected seed, seed with shell broken showing the germ in the centre of the kernel, germinated seed (germ first appeared on August 24th 1911) doubtful seed that should germinate out quite 60%, seed in pod, and ordinary good seed.

Mr. Kirk also sent in a number of Rubber Stumps, showing how nursery plants ought to be stumped; and there can be no doubt that his liberality did much to enhance the interest of the Exhibition.

TEA.

There were only a few samples—1 lb. packets from Travancore; Pekoe, &c., from the Malabar Rubber and Produce Co., Ltd., and from Bonami Estate (Travancore Tea Estate Co., Ltd.)

MISCELLANEOUS.

A very nice collection of Sisal fibre and rope was shown, Messrs. J. G. and F. M. Hamilton being the exhibitors. Some glass Latex Cups arrived, a little late, from London, and a variety of chemicals, insecticides, etc., with oil and poonac from Pará Seed, were shown by the Scientific Department of the U. P. A. S. I. Camphor from the Bababudins, and Arrowroot from the Shevaroys call for special mention.

Warm thanks are due to the Scientific Officer for the energy with which he carried out all arrangements and the forethought with which he planned them. To him, mainly, the success of the exhibition was due. The

Chairman helped him very considerably, working hard for several days. Mrs. J. G. Hamilton mounted series of coffee leaves showing the increasing stability of type produced under hybridisation methods; while Mrs. J. M. Hamilton superintended the artistic arrangement of these leaves, and rendered very valuable general help.

Visit to the Indian Institute of Science.

Of the three invitations to delegates of which mention was made in the Annual Report, only one was accepted. In the case of the Mysore Tannery and Scovell's Estate delegates were left to decide for themselves whether to visit these places or not. The invitation accepted was that of the Director of the Indian Institute of Science; and on the afternoon of August 30th, the delegates all drove out to that Institute. A few ladies and some of the visitors present at the U. P. A. S. I. meeting accompanied them.

Dr. Travers, F.R.S., and his staff had evidently spared no trouble in making preparations to receive his guests. Though a great part of the huge edifices that are being constructed is very far from complete, there was plenty to be seen in the way of laboratories, machinery, &c., &c. Dr. Travers and Professor Norman Rudolf divided the duty of "personally conducting" their guests, and as they took detachments round gave lucid explanations of what was being shown. Dr. Travers aroused very great interest by giving a little practical display of the art of glass blowing, while Professor Rudolf occupied himself more especially with the machinery sections, which contain many things that probably are not to be seen in any other part of India.

A very pleasant evening was spent. To Dr. and Mrs. Travers, and Professor Rudolf, and other members of the Institute staff, cordial thanks are due. On the social side, as on the scientific, the motto of the above gentlemen would appear to be "Thorough."

CORRESPONDENCE.

Distillation of Camphor.

Sir,—Mr. Anstead is, I have no doubt, overloaded with work, but I think it would not take up much of his time were he to give a sketch and details in the *Planters' Chronicle* of the most suitable still for distilling camphor. I have a fair number of camphor trees to commence work on which I am unable to touch, until a suitable still has been obtained.

(Signed) J. J. McKenzie.

Naduvatam, September 4, 1911.

[Mr. Anstead's description of a Camphor still, as given at the Annual Meeting of the U. P. A. S. I. this year, will be published in due course in the Book of Proceedings, 1911.—Ed., *P. C.*]

Tropical Life wrote recently:—Following the shortage in Ceylons the attention of the trade here has been diverted to Southern Indian varieties to make up the dificiency, with the result that the increase from Travancore and the neighbouring districts has been well received, and with quality on the whole excellent, remunerative prices have willingly been paid. The average of public sales in London on growers' account is about $8\frac{3}{4}d.$ against $8\frac{1}{3}$ the previous season, and $7\frac{7}{8}d.$ in 1908-9. . . .

"The scramble for tea during the early months of the present year has drawn attention to other possible sources of future supply, and from countries not previously known as tea-producing, come rumours of planting and cultivation. . . .

The labour question is becoming one of the most important problems to be faced in all producing countries.

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(INCORPORATED.)

Mysore Exhibition, 1911.

Hon. Secretaries of District Planters' Associations have been informed that Messrs. Spencer & Co., Ltd., have consented to take charge of a Tea and Coffee Room—intended as a sort of Demonstration Room—in connection with the Planters' section at the Mysore Dasara Industrial and Agricultural Exhibition, 1911. When this news was sent round, the date fixed for the opening of the above Exhibition was September 25, but it now transpires that there will be a few days delay, the Exhibition not being likely to be opened until about the 30th instant.

This will allow a little more time for preparations. The exhibits from the U. P. A. S. I. Exhibition are being packed for despatch to Mysore; and it is hoped that they will be supplemented by some further specimens. The little attempt to popularise South Indian Tea and Coffee would also be materially helped forward if a small number of planters would each send forward a few pounds of tea or coffee for use "in the cup;" such supplies to be handed over to Messrs. Spencer & Co., Ltd., free of charge. They might also send some Tea in packets *for sale* (on commission terms). Messrs. Spencer & Co., propose to charge specially low rates for cups of Tea and Coffee, so that price may not stand in the way of sales; and they deserve special support, as they are not aiming at a profit, but merely at helping to popularise these products among consumers.

Mr. Anstead has been requested to take charge of all arrangements, and Mr. G. H. Krumbiegel, President of the Exhibition Committee, has promised all the help that he can give. A good location has been allotted; and there can be little doubt that the opportunity for "bold advertisement" will prove to be a very useful one.

Exhibits, &c., should be kindly despatched per rail or post direct to Mr. Anstead at Mysore, (Empire Hotel), so that no time may be lost. He is particularly desirous that further exhibits of Tea should be sent in, as the present display is by no means representative.

Volume III.

This is out of print, supplies of two or three of the monthly numbers having run out. Several inquiries for it having been made, the Editor requests that all who want this volume to complete their files will kindly send in their names. If at Rs.3 per volume the supply needed would about cover the cost of reprints and binding, arrangements shall be made as soon as possible to execute orders.

Scientific Officer's Papers.

No. LXXVII.—Rubber Experiments on Periyar Estate.

The Preliminary Report on the Manuring Experiments of the Malabar Coast Planters' Association, was presented by Mr. H. B. Kirk, at a meeting of the Association held on 17 December 1910, (*P. C.*, Vol. VI, p. 17).

A progress report has just been received from Mr. Kirk giving the results obtained at the end of the first six months, and a further report will be published at the end of the year.

I. *Experiment to compare results between pollarding every other tree in a row and cutting out every other tree.*

Two rows of trees, A and B, were taken, the trees in which are 7 years old, the rows being 20 feet apart and the trees 10 feet apart in the rows.

Thinning out in some form is necessary on this estate, and will be necessary on other estates in the near future, since the net-work of roots in the soil and the interference of the crowns of trees planted at this distance has been found to diminish the yield of latex, and this experiment was designed to test the best method of doing this thinning out.

The pollarding was done with a view to finding out if the yield from the pollarded tree and the next tree to it added together would be very much more than from the single tree left after cutting out. It is intended to finally cut out the pollarded trees after one year's tapping has been done on them, and to tap them to death during the last six months.

In Row A every other tree was pollarded at a height of 10 feet from the ground in May 1910. Tapping was begun on them on 1st December 1910 after they had all thrown out strong new shoots.

In Row B every other tree was cut out and all the roots removed in May 1910. Tapping was begun on the trees left on 1st December 1910.

Between 1st December 1910 and 30th June 1911, the trees in each row were tapped 60 times, tapping being done every alternate day. Owing to the drought, tapping was stopped from 19th January to 18th April 1911, and it was noticed that the pollarded trees suffered far more quickly and more acutely from the drought than the trees left in Row B.

The yield of latex from 1st December 1910 to 30th June 1911, and other details, will be found in the following table:—

Row.	Number of trees.			Average girth of trees at 3 feet from the ground.	Yield of dry rubber, including scrap, from 1st December 1910 to 30th June 1911, per tree.		
	Pollarded.	Untouched.	Total.		Pollarded.	Untouched.	Total.
A	96	96	192	21·4 inches.	7·52 ounces.	13·05 ounces.	20·57 ounces.
B	—	93	93	23·83 inches.	—	16	16 ounces.

From this it is deduced that, as far as the experiment has gone at present, it is better to cut out every other tree. Although at first Row A

with 2 trees to every one in Row B gives rather more rubber, the one tree in Row B gives 80% of the yield of the two trees in Row B, and the cost of tapping is very much cheaper.

This experiment was also designed with a view of finding out if the letting in of light to the ground would materially increase the yield of the alternate unpollarded trees. The result shows that it makes very little difference to them, so that there is no object in pollarding before cutting out. The alternate trees to be cut out can be tapped hard every day for a year to extract the maximum quantity of latex, and this would give an enormously increased yield that year which the pollarded trees do not do. This is the most important conclusion which has been come to from this experiment.

II. *Experiment with Manures.*

Four rows of 7 year old trees were selected for this experiment, planted 20 feet by 10 feet.

Row C, containing 131 trees of an average girth of 23·87 inches, received no manure.

Row D, containing 130 trees with an average girth of 23·79 inches, received 5 lbs per tree of the following mixture recommended by Mr. Kelway Bamber from an analysis of the soil;

400 lbs.	Fish.
200 ,,	Castor Cake.
50 ,,	Sulphate of Amonia.
120 ,,	Blood meal.
50 ,,	Superphosphate.
100 ,,	Steamed Bone meal.
80 ,,	Sulphate of Potash.
1,000 ,,	

This contains 5·67% Nitrogen, 5·6% Phosphoric Acid, and 4% Potash.

Row E, containing 132 trees with an average girth of 22·9 inches, received 5 lbs. per tree of the following mixture:—

500 lbs.	Basic Slag.
300 ,,	Sulphate of Potash.
400 ,,	Nitrolim.
1,200 ,,	

This mixture contains 6% Nitrogen, 8·33% Phosphoric Acid, and 12·5% Potash.

Row F, containing 136 trees with an average girth of 23·39 inches, received 2½ lbs. of Nitrolim per tree.

In every case the manure was applied in exactly the same way; forked in 9 inches deep in two strips of four feet wide four feet away from the trees in the 20 foot line.

Tapping was done every other day from 1st December to 30th June, there being a period of drought from December to April, and 70 inches of rain in June which interfered with tapping to a certain extent. Thus the trees in each row were tapped 15 times in December, 8 times in January, 7 times in April, 16 times in May, and 14 times in June.

The results obtained are summarised in the table below :—

Row.	Number of trees.	Average girth at 3 feet from ground.	Number of times tapped.	Yield in dry Rubber including scrap from 1st December 1910 to 30th June 1911, per tree.
C	131	23·87 inches.	60	11·87 ounces.
D	130	23·79 „	60	13·74 „
E	132	22·9 „	60	10·76 „
F	136	23·39 „	60	10·68 „

As this is only to be considered a progress report, discussion of the results will be postponed until the final report, when the manures have had time to produce their full effect.

Unfortunately the yield of each row before any manures were applied is not known. The rest of the field gave a yield of 11·45 ounces per tree during the same period, but this is not a fair guide, since individual trees may differ a great deal in yield.

H. B. KIRK,
Manager, Periyar Estate.

RUDOLPH D. ANSTEAD,
Planting Expert.

Natal Tea.

In the Monthly Notes on Empire of India Trade and Industry in the August number "United Empire," the Royal Colonial Institute Journal, the following appears :—

"*Natal Tea Industry.*—The Durban Chamber of Commerce, in the course of its review of the trade of the colony, states that the season which closed about the end of May will, it is feared, not show any appreciable increase in tea output over that of the previous year. It may be, that some small acreage has been added to the plantations, perhaps 200 acres, making a total area in the colony under tea of, say, 6,000 acres, two-thirds of which would be in full bearing. But owing to a period of drought in January and February, 1911, it was not likely that the total output of manufactured tea in the province will reach the estimate for last year of 2,092,000 lbs. It would not be unreasonable to reduce this figure to 2,042,000 lbs., as the probable output for the season now closing. Another fact which, it is stated, has seriously discouraged the extension of tea planting has been the stoppage of the supply of indentured Indians after June 30th, 1911. Natal tea is well in favour with the South African populace, the machinery of push and advertisement has been well worked, and the price has risen, making the industry more remunerative. The demands for Natal tea have been larger than ever before, stocks are lower, much less tea has been exported, and prices in London have been raised considerably of recent date."

Notes and Comments by the Scientific Officer.

130. *Eucalyptus Plants.*—With reference to the Scientific Officer's Paper No. LXII, (*Planters' Chronicle*, Vol. VI, p. 235) on the subject of 'Eucalyptus Trees Suitable for India,' Mr. G. H. Krumbiegel, the Economic Botanist of the Government of Mysore, has very kindly furnished me with the appended list of species of Eucalyptus available at the Lal-Bagh Gardens, Bangalore. These plants are for sale at four annas each, but large quantities are not available. With a view to wider distribution, lots consisting of 12 to 18 of each kind can be obtained for trial. Seed in quantity is now being imported of the more useful kinds for actual plantation purposes.

List of Species available.

Eucalyptus citriodora (Lemon-scented Gum).
,, bicolor (Black Box).
,, acmenoides.
,, crebra (Narrow-leaved Ironbark).
,, gunni.
,, Stuartiana (Apple-scented Gum).
,, pilularis (Blackbutt).
,, hemiphloia (Australian Box Tree).
,, rostrata (Red Gum of S. Australia).
,, siberiana (Tasmanian Ironbark).
,, bositoana (Ribbon Box).
,, odorata.
,, rudis (West Australian Canoe Bark Tree).
,, cornuta (The Yate Tree).
,, gigantea.
,, resinifera (Red Mahogany of New South Wales).
,, tereticornis (Queensland Blue Gum).
,, viminalis (Mulnna Gum Tree).
,, punctata (Leather jacket or Hickery Gum of New South Wales).
,, saligna.
,, meliodora (Yellow Box Tree).
,, siderophloia (Dark or Broad-leaved Ironbark).
,, paniculata (Red Ironbark of New South Wales).
,, pulverulenta.
,, microcorys (Tallow Wood).
,, sideroxylon (Ironbark Tree).
,, globulus (Blue Gum).

131. *Mulching.*—The following Note appears in the Journal of the Jamaica Agricultural Society for June:—

"The result of mulching in carefully noted experiments in field practice has been a substantial profit. Bush and grass on roadsides and hillsides are no longer simply bush and grass-weeds to the knowing eyes, they are mulching material, and as such of value.

"The mulch keeps the moisture in the soil, prevents weeds growing, and bit by bit the mulch becomes manure. So that in the bush and grass everywhere about, there are thousands of tons of manure to be had for the cutting and transport."

I have many times suggested that more use should be made of the material which grows on the spaces to be found along roadsides and round the lines &c., more especially on Coffee Estates.

RUDOLPH D. ANSTEAD,
Planting Expert.

CORRESPONDENCE.

The Scientific Assistant for Mysore.

Sir,—I hope that you will be able to give me space to repeat at some length what I have already said, regarding the Mysore scheme for an Assistant Scientific Officer.

With all the experience we have had of the difficulty in working the U. P. A. S. I. properly during the past few years, it looks to me a little rash to enter into new schemes or enlarge old ones unless we have a considerable margin in the way of funds at the outset.

It would surely be sound policy to include Coorg for a year or two anyhow, and then if enthusiasm waned, as we know it does sometimes, to make no change, but if the idea continued to meet with increasing support to engage another man, either as general assistant over all four districts, or to take charge of a part. The objection has already been raised in conversation that there would certainly be a difference of opinion as to who should take the new man, if we decided to separate. If no amicable settlement could be arrived at between the four Associations and the first Assistant, it would be perfectly easy to submit the point to arbitration. Naturally all parties to arbitration are not sure to be satisfied, but there must be "rubs of the green" in all lines of life and true sportsmen must put up with them.

It must be noted that we have already suggested a term of two years probation for the Assistant so the end of that time would be a convenient point for readjustment if any is necessary.

It is true that the ground to be covered is extensive, but it is already covered by Mr. Redmond in another line of work. It would not be reasonable to expect a man to visit every Estate. Our troubles are as a rule identically the same, and our conditions are not so varying that they cannot be explained. provided that the man concerned has a good general working knowledge of the whole country to be dealt with by him. No doubt, some increase in the travelling allowance would be required, but that is a small matter with a much larger subscription. There are few long journeys needed, as the Coffee is almost continuous in all directions.

I do not wish to argue that there is not enough work for two men, far from it, only that it is unwise to engage them with only just enough money, which might easily become just too little with a few failures or defections.

My present views would lead me to suggest that we do not separate eventually from Coorg if it can be avoided. Our troubles and conditions being, as I have said, practically identical, it might be sounder policy to have two men covering the same ground but studying different problems. Perhaps Mr. Anstead may support me in this, as it seems nearer his original suggestions. A man working a few problems over a large district is more likely to arrive at some definite decision, than one struggling with a large variety of subjects in a limited area.

We may find it advisable to engage a man with some other qualifications than those we demand at first; and if we decide to act separately now future efforts in that direction will be very seriously hampered; we could not hope to be able to engage another specialist unless we were prepared to put down another Rs.8,000 per annum.

I cannot undertake to enter into prolonged private correspondence, but if my views are deemed worthy of criticism, whether privately or in your columns, I shall be glad to try to reply through the latter medium if not convinced that my critics are in the right.

Mudigere, 11th Sept., 1911. JNO. G. HAMILTON.

TEA.

Ceylon Tea Planting Methods *vs.* Indian.

AN INDIAN VISITOR'S CURIOUS COMMENTS.

The *Times of Ceylon* gives publicity to the following letter :—

Sir,—Having been for many years a tea planter in the Bhutapore district in India, I have been very interested in, but also surprised at, the methods employed by Ceylon planters in working their gardens, and I think that they make many mistakes, which I hope these remarks of mine may help to rectify. I have lately been visiting the Maskeliya, Dickoya, and Dimbula Districts, where every kindness was shown me by planters, who were anxious to explain everything to me, but I cannot say any of their arguments have convinced me, that they were working their estates to the best advantage.

I have been thirty years in charge of one of the finest tea estates in India, and I think I am in a position to give advice as how *tea* should be worked and cultivated, and I trust, that some of them will ere now have carried out some of my suggestions.

To begin with, all advances should be wiped off entirely, and the coolies should be paid daily by the superintendent or his assistant.

Their pay should be fifty cents a day, and they should be charged rent for their lines. This would cause them to take greater care of these buildings which should be built of brick and have glass windows to open outwards. The floors should be of cement, and a little cheap furniture provided.

As regards manure, I do not believe in applying this at all to tea. It is far cheaper to plant a nitrogenous weed called " Ghutera," the seed of which can be purchased from Messrs. Banerjee of Bombay.

When this seed is well in flower, it should be well trampled in by foot, and not forked, as the latter causes wash. This will be found to give about 3,000 lbs. of nitrogen per acre if properly planted.

Pruning in Ceylon is, I understand, only carried out every two years or so. Now, this is a mistake. The bushes should be allowed to run for at least four years, the last year of which they should not be plucked at all. At the beginning of the fifth year, they should be pruned to eighteen inches, and the heavy fallen branches stacked around the trunks and frames. When properly dried, the dead branches should then be fired, so that literally a small bonfire should spring up in each tree.

This will give a great quantity of natural potash manure, and the blackened stumps of the bushes will soon recover and give big crop in years to come.

Plucking in Ceylon is, I consider, carried out too lightly. At least five and six leaves should be taken as I do at Bhutapore (and my crops beat all the figures I have been shown here).

Manufactured tea should not be packed in chests as these cost money, but the made tea should be packed in gunny-bags made waterproof by a slight solution of rosin and tar.

Trusting my suggestions will be found of value to the hospitable Ceylon men, whom I am leaving behind me.—Yours, &c.,

"INDIAN EXPERT."

E. O. T. P., Colombo, September 8th.

China's Tea Trade.

A British Consular Report on the Trade of China for the year 1910 states :—

The total export of China teas in 1910 amounted to 208,107,000 lbs., an increase of 4 per cent. on the 1909 figures. Of this export, Russia took 130,000,000 lbs. or 62 per cent.; the United States, 19,600,000 lbs. or 9 per cent.; and the United Kingdom, 17,200,000 lbs. or 8 per cent.

The actual consumption of China tea in the United Kingdom was only 10,310,000 lbs. out of a total of 287,673,200 lbs., that is to say, 3·58 per cent.

A British tea merchant has been good enough to furnish me with the following remarks on the China tea trade in 1910 :—

"Speaking generally, the season proved a satisfactory and profitable one to exporters from China to Great Britain. Black (Hankow teas) paid on the whole; the low-priced qualities were in demand by blenders owing to the high prices ruling for the Ceylon and Indian leaf. Finer teas met with the usual small fancy demand, towards the end of the year grades from say 10*d.* to 1*s.* 1*d.* per lb. were suddenly cleared off the market by Russia, owing to the plague scare and fears that next season's production might be interfered with. Stocks of China tea in London are therefore small, and prospects for forthcoming season good.

"The Shanghai green tea trade was not altogether satisfactory to British merchants. The London market was dull and lifeless and the American trade was upset by the action of the United States Customs authorities in suddenly enforcing the 'Pure Food Act' and rejecting many parcels, including some choice qualities, owing to the presence of some deleterious matter used by the Chinese in colouring the leaf. We have since been officially notified that no coloured teas of any kind will be admitted into the United States of America next season. This new regulation, if rigidly enforced, is likely to have far-reaching effects on Shanghai's green tea trade with America, as that country practically takes all the Pingsueys shipped, and it is extremely doubtful if the uncoloured article will appeal to consumers to the same extent."

As the world's demand for tea is steadily growing, while the supplies from India and Ceylon are for various reasons not increasing in proportion to this demand, the moment would appear to be opportune for the Chinese Government, who have recently devoted a good deal of attention to the question of the improvement of native produce, to take some practical steps towards encouraging the native growers to improve the quality of their teas by adopting more scientific and careful methods of cultivation and preparation of the leaf. Even should these measures and the activities of the China Tea Association result in doubling the consumption of Chinese tea in the United Kingdom, the percentage would still be so small, and the chance of its ever regaining its whilom popularity so meagre, that I do not think the Indian tea planters need regard the revival with any apprehension. On the other hand, while increased shipments of China tea to the United Kingdom would be of no inconsiderable advantage to British merchants and shippers engaged in the trade, the British public would benefit by the influence these additional supplies would have in keeping prices at a reasonable level.

China imported in 1910, 14,000,000 lbs. of Indian leaf, chiefly dust, for use in the Hankow brick tea factories.

RUBBER.

In the Federated Malay States.

EXTRACTS FROM REPORT OF THE DIRECTOR OF AGRICULTURE FOR THE YEAR 1910.

The year 1910 has been a remarkable one in the history of the rubber industry. The high price of rubber during the early part of the year and the realisation the European investors of the value of rubber shares brought about the so-called "rubber boom" and the price of shares reached very high figures. That the industry came through this period with so few failures is one of the strongest proofs that could be offered of its inherent soundness.

The price of rubber fluctuated considerably during the year. Starting at 7*s*. per lb. in January (sheet and biscuit), it rose to 8*s*. 2*d*. in February, to 9*s*. 7*d* in March, and finally reached 11*s*. 10½*d*. in April-May, after this there was a fairly steady decline to 8*s*. 5*d*. per lb. in July, and to 5*s*. 5*d*. in December. The lowest figure was 4*s*. 9*d*. in October. The cost of production has probably increased above that given in the Directors's Report last year, and might be given now as 1*s*. 6*d*. per lb. It is obvious that the industry should be fairly prosperous, even if the price of rubber fell considerably below the minimum of 1910.

The acreage opened in the Federated Malay States in 1910 was 48,813 acres against 28,905 acres in 1909, and 41,813 in 1908, the largest proportionate increase being in Negri Sembilan. Perak shows the greatest increase over 1909.

The rubber output for the Federated Malay States again increased by over 100 per cent., and is almost four times as great as that of 1908. The output for 1910 was 12,563,220 lbs. against 6,083,493 lbs. for 1909.

The "output," as given here, for the Federated Malay States, is about 400,000 lbs. in excess of the 'export' of rubber as returned by the Commissioner of Trade and Customs (12,212,526 lbs.). The difference of course, represents largely the amount of rubber on hand, in drying houses and stores, on the plantations at the end of the year. The largest excess was in Perak, where a number of factories were making blanket crepe towards the end of the year, and this requires a much longer drying period than the thin crepe, and consequently larger amounts were in the stores than previously.

The percentage of increase for 1910 in the various States is in:—

Selangor	90 per cent.
Perak	190 ,,
Negri Sembilan	100 ,,

while Pahang now appears on our columns for the first time with an output of 2,483 lbs.; this last is probably not as high as it should be, as the Commissioner of Trade and Customs' figures show a much larger export.

The total output for the Peninsula also increased by over 100 per cent., and amounted to over 6,400 tons as against 3,000 tons in 1909. Large increases are shown by Province Wellesley and Johore, while Kelantan and Kedah now appear as exporters for the first time with an output of nearly 19 tons. The increase in Malacca is also large, but the figures for both last year and this are very uncertain.

The increase in output in the Colonies and Protected States for 1910 is in:—

Province Wellesley	50 per cent.
Johore	100 ,,

The total acreage planted up in rubber at the end of 1910 in the Federated Malay States was 245,774 acres, an increase of 25 per cent. over that of 1909. The total acreage for the Peninsula was 362,853 acres, an increase of 23 per cent. on the acreage of the previous year.

It is difficult to prophesy with regard to rubber, but I should judge that for the next four years the increases for Malaya should be at least 10,000,000 lbs. for 1911, 15,000,000 lbs. for 1912, 15,000,000 lbs. for 1913 and 20.000.000 lbs. for 1914, provided that the supply of labour is sufficient to perform the necessary tapping and other agricultural operations on the acreages opened up during the past few years. After that the output should show a steady increase for the following four years, provided, of course, that nothing unforeseen arises to cause the abandonment of already planted land, after which the increase may be slighter. In 1906 the output for Malaya should be at least 65,000 tons on the present acreage alone.

Crops grown with rubber may be divided into two classes: the catch crops and cover crops. Catch crops are those grown with the object of obtaining revenue for the land, during the first four or five years, up to the time when the rubber is at the producing stage. Agriculturally they are not to be recommended. The growth of the rubber is materially retarded, the catch-crop yields returns for only a few years, then unless the stumps of these plants are left to serve as reservoirs for root disease, there is considerable expense to be incurred in clearing them out. The principal catch-crop in Malaya is coffee. In the Federated Malay States only less than six per cent. of the rubber acreage is planted with catch-crops as against 10 per cent. for 1909, while for the Straits Settlements the percentage is only 28 per cent. against 40 per cent. last year. Evidently the practical planter is realising more and more the disadvantage of the method of cultivation.

Cover crops are planted between rubber, at present principally with the object of reducing the expenditure on weeding, until the rubber trees have grown sufficiently to kill out the weeds by their shade. Where labour is insufficient to keep an estate clean-weeded, the use of a cover crop may be recommended as it may require less keeping in order than the original weeds, and at the same time be less harmful to the trees. There is, however, no cover crop that can be unconditionally recommended in Malayan plantations, and undoubtedly the best procedure at present is absolute clean weeding, where the labour force is sufficient to obtain it. If a leguminous cover could be introduced, which could be easily kept under control, it might be preferable even to clean weeding, particularly if it could yield sufficient revenue to pay for the cost of its own cultivation. At present the department is experimenting with ground-nuts, to determine if this crop will satisfy the conditions named, besides a number of non-revenue producing covers.

Tapping is a subject that demands mention. In spite of numerous new inventions, the favourite instruments are still the simpler tools, the gouge (straight or bent) and the farrier's knife or jebong. Which of these is best depends really on which the tapping cooly is used to. Where there is sufficient European supervision and a stable labour force the tapping in Malaya is usually excellently done, with consequent good renewal of the bark. Where one or other of these conditions does not obtain, it is common to see wounds right down to the wood. The results of bad tapping will be noticeable in about four years' time, when the irregularly renewed surface comes to be tapped again; the tapping will then be very difficult to carry out and still more difficult to carry out without again increasing the damage. Some of the oldest trees in various places in the Federated Malay States are an object lesson in what may be accomplished by bad tapping; little blame

can be attached to the original workers, who had to learn by experience how to tap and how not to; but estates with trees now being tapped for the first time should profit by others' experiences, as upon the quality of the present tapping, a good deal of their future prosperity will depend. I strongly recommend that all wounds to the wood in tapping be immediately painted with cold coal tar. This draws attention to bad tapping and saves attack by wound-fungi and borers.

Overtapping, especially of young trees, is another procedure to be avoided, though still too common doubtless owing to the high price of rubber. No system that does not provide a fours' renewal of the bark can be described as sound, and I think this is recognised by most planters, although some may not be able from various reasons to adopt such a system.

The manufacture of rubber may bestbe described as still in the experimental stage, neither buyers knowing sufficiently the kind of rubber that is best for manufacturing purposes. What is most wanted in the industry, is a simple and reliable test for the strength of rubber as it leaves the plantation factory, comparable to the polariscope test for sugar; I may add that such test is, so far as I can tell, not in sight, and rubber now can only be judged by colour and general appearance, until after it has been vulcanised. At present, there seems to be preference for smoked rubber, and many estates are contemplating the erection of smoke houses and will be turning out smoked sheet largely in place of the hitherto favoured crepe. The smoke houses are usually two-storied, the rubber being hung, as taken from the rollers, in the upper, while fires are kept going below; openings of various sizes and descriptions are made in the floor between the two stories. Cocoanut husks form about the best fuel obtainable in large quantities, and it is quite probable that estates which have cocoanuts planted up as a secondary crop, will find them of great value for this purpose alone, as the demand for husks will increase considerably in the next few years. The movement appears to be quite a sound one, as there is little doubt that properly smoked rubber is actually stronger and better than unsmoked, apart from all temporary fashionable demands.

Two fungoid diseases of rubber alone fall for mention: root disease due to *Fomes Semitostus*, and die-back due to *Thyridaria (Diplodia) tarda*. These with other diseases are treated more fully in the report of the Mycologist appended. Root disease is very commonly present in plantations, and is responsible for a considerable loss of trees per acre every year. Fortunately, it differs from most other root diseases caused by related fungi, in that of the *Fomes* is not able to exist for long periods in ordinary soils apart from the plants it is parasitising. On this account, energetic and early treatment of individual cases as they occur should in the course of a few years almost entirely rid most estates of this fungus. The department has rendered advice and assistance to many estates on this subject and is always ready to do so.

Die-back has been shown by the Mycologist to be due to the same fungus that causes a similar disease in cacao in many parts of the world. On a well-conducted estate, where the trees are healthy, it is not a disease to be feared, but it must be watched. I have known *Diplodia* for many years and have never found it causing serious trouble except when the trees are originally unhealthy, thus predisposing them to attack. Careful attention to all wounds produced either by natural or artificial causes and cutting off diseased branches, well below the apparently attacked region, in early stages, should ward off serious trouble on most estates in Malaya. Where the trees are originally unhealthy, either from bad drainage or other

unfavourable soil conditions, there *Diplodia* may cause very serious losses, and special efforts should be made to ward off infection and to improve the external conditions.

Of insect pests, *Termes gestroi* is still commonly present and requires steady attention. The Entomologist has visited a number of estates in this connection and given advice as to treatment. Most estates now treat this pest with success, following the Entomologist's recommendations.

Borers have also received attention, they usually enter at a dead surface, but often proceed from this into the living tissues, where they may do considerable damage. Here, again, is seen the need of careful attention to wounds, especially those made in tapping.

Another phenomenon that may be described as a disease is the formation of large lumps of woody tissue covered with bark, too often seen on old rubber trees. These appear to be buds developing under pressure. The power to develop these seems latent in most rubber trees but usually some external stimulus is necessary to bring out this power. Occasionally no such stimulus can be traced, but the vast majority of lumps can be at any rate strongly suspected to be caused by bad tapping. Where the cut goes down to the wood, such a development is probable, but it may be that a cut, which does not go quite so deep and only grazes the cambium, may be sufficient stimulus. The lumps do not interfere with the health of the tree but they considerably reduce its value for tapping purposes.

EXTRACT FROM REPORT OF THE MYCOLOGIST FOR THE YEAR 1910.

RUBBER.

I assumed my duties on the 18th of August. The first month of service was devoted to getting the laboratory and literature into working order, to dealing with local correspondence and to establishing communication with other tropical Agricultural Departments, and to visiting rubber estates for the purpose of becoming acquainted with the conditions under which *Hevea brasiliensis* is cultivated in the Federated Malay States. Ten estates were visited during that period.

Later work has been directed towards the study of the "die-back" disease, of the common root disease of Pará Rubber, to investigations on certain fungi which were associated with pathological effects of the plant for the purpose of ascertaining their capacity for causing disease, to investigations on fungi which are parasitic on robusta coffee, camphor, tapioca and Ceará rubber, to a study of bacterial disease of tomato and potato, to the answering of correspondence, which consisted mainly in the diagnosing of pathological influences, and to visiting estates for the purpose of recommending treatment for disease.

FUNGUS DISEASES.

Four and one-half months were available for work up to the end of the year, and this afforded time to commence investigations on the "die-back" fungus, on the common root fungus and on the "thread-blight" fungus of Pará rubber. My investigations on the "die-back" fungus had been commenced before my departure from England and were practically completed by the end of the year, the establishment of the identity between this fungus and the "die-back" fungus on cacao in other parts of the tropics has been made, and a fairly accurate knowledge of its life-history has been obtained. A preliminary note on these points was issued in the *Agricultural, Bulletin* of December, 1910. . . .

Greater attention has been paid to the diseases of *Hevea brasiliensis* than to those of other plants. To review the diseases of this plant from a

general aspect, it may justly be said that the plant compares most favourably with the staple plant industries of other tropical countries. It must, however, be admitted that the continued cultivation of one plant in pure culture over large areas, without the intervention of other crops or, in many cases, of belts of natural jungle, lends itself somewhat readily to the development and spread of fungus disease. It should not, therefore, be surprising if there were an increase of its parasitic fungi, both in quantity and in number; this will call for the application of methods of treatment other than those which are employed at the present day.

Some danger may arise both from the importation of pests and from the absence of proper treatment of disease in native cultivations.

DISEASES OF PARA RUBBER.

ROOT DISEASES.—*Fomes semitostus*, Berk., appears to be more prevalent in this country than in Ceylon. The amount of the fungus which is present on young clearings is directly proportional to the amount which is present in the original jungle. The fungus, therefore, continues to make its presence felt among younger rubber, where a death-rate of as many as 16 per cent. of the trees has been recorded in 18 months. Consequent upon the removal of timber, the isolation of diseased areas by a system of trenches, the removal of trees which have succumbed, the digging over and subsequent liming of diseased areas, the fungus gradually disappears as the rubber grows older, until on those estates where careful treatment has been practised, it is practically absent among the older rubber. The rate of spread of the fungus mycelium in the soil is directly proportional to the water-content of the soil or, in other words, to its capacity for drainage. Where as on the lighter soils there is no appreciable spread of mycelium independently of actual contact with roots, on the low-lying, damp, heavy and badly drained soils an independent spread of the mycelium occurs, and the rate of growth, and consequent period of retention of the fungus by the soil, are much increased. This is a factor which has not hitherto been brought to light and which should be borne in mind in the opening up of land for planting and in the drainage and removal of timber of the heavy, lowlying soils. The application of quicklime does not much loosen the soil and has also marked fungicidal properties. As much as one or one-and-a-half tons to an acre may well be applied.

The fungicidal properties of good quicklime are well-known, but there is much difficulty in obtaining good quicklime in many places and the material which is sent out by business houses is frequently completely slaked. Attempts are being made to introduce a powerful fungicide which is applicable to a large area of soil. An experiment was conducted with carbon bisulphide, the object being to kill the mycelium which was present in the soil by the vapour of the liquid. For this purpose a badly infected area of one half of an acre was selected and injected on 26th September by carbon bisulphide by means of a Vermorel's "Pal Excelsior" injector, the injections being three feet apart and, hence, about 4,000 to an acre. An examination at the end of five weeks showed that the fungus mycelium was just as abundant as before. The failure of the vapour to kill the mycelium was attributed to the rapid vaporisation of the liquid at the temperature of the soil and to the small diffusion of the vapour in damp soils. A formal dehyde compound, which has recently been put on the market and which appears to have met with some success, will shortly be experimented with, on as large a scale as possible. It must, however, be borne in mind, that the application of such a fungicide is only regarded as being necessary where the land is low-lying and almost swampy, and where, as the result of scarcity of capital and labour,

of the absence of removal of timber or of the previous cultivation of another crop which harboured the fungus, or of the absence of good methods drainage and of treatment of isolated cases of disease from the outset, the fungus mycelium is widespread through the soil. Its application is therefore secondary to the establishment of good methods of cultivation.

The work on the life-history of the fungus and on such factors as the spread of the diseases and its method of treatment is in progress and will be published in a seperate Bulletin of the department.

Hymenochaete noxia, Berk., appears to be present in this country only in small quantity. The fungus is said to be the commonest root fungus of *Hevea* in Ceylon. Essentially a jungle product, it was recorded in Samoa as early as 1875, and it is now known to be somewhat widely distributed through the Eastern tropics. Both in this country and in Ceylon, there appears to be some considerable difficulty in obtaining fruiting specimens, while in Samoa, and on material which I have examined from West Africa, the fungus appears to fruit abundantly. The disease is known as the "brown root" disease, and, in spite of the absence of fructifications, it is easily identified by the presence of fawn-coloured strands on the roots when the mycelium is young and by the production of dark-brown or almost black sheets of older mycelium which aggregate earth and small stones into masses on the surface of the roots; it is more specially observable on the tap root. The fungus spreads very slowly and only in contact with roots; isolation, is, therefore, unnecessary, and so also is liming, providing that the diseased roots are removed and the wood from the affected area taken up and the area dug over. An examination of the laterals of trees which are adjacent to the dead tree should be carried out, and such as are diseased, should be amputated to a point were they are healthy.

STEM DISEASES.—*Thridaria tarda*, Bancroft, of which the *Diplodia* stage causes the "die-back" disease, has been investigated and the life-history completed. The fungus, which is common as a saprophyte on dead material, can infect the plant at wounds. Investigations have shown that the fungus can be transferred from cacao to *Hevea*, and that the Diplodia condition of the fungi on cacao and *Hevea* are identical. This, coupled with the work of other authors, shows that the fungus is widely distributed through the cacao and rubber producing countries of the Tropics. The fact that the fungus only infects at a wound which involves the exposure of the wood, and therefore, not a good tapping surface, coupled with the fact that its effect on the plant depends largely on the condition of health of the plant, classes it as an ordinary wound parasite.

The disease has been reported from all the Federated States of the Peninsula. There is, however, a great tendency to attribute far more effects to the fungus than are in reality initiated by it, and the reckless removal of branches, which are shedding their leaves from some physiological cause, must be guarded against.

The work, which furnishes an account of the life-history of the fungus, the spread of the disease and its method of treatment, will be published shortly in *Bulletin IX* of the Department of Agriculture.

Corticium javanicum, Zimmermann, the "pink" fungus has been reported from two districts, where it was, however, present in small amount. It is a well known parasite of *Hevea*, tea and other plants in India and in Ceylon. The disease originates most usually at the fork, where the fungus produces a pink patch which extends to the sides of the trunk below and to

the branches above the fork. It is easily identified by means of the colour. The removal of the fungus with adhering bark when it is young and the sealing of the wound has been recommended. Such branches as are ringed by the fungus must be amputated, and when young trees are affected they must be cut off below the affected part. These are direct methods of treatment. In places where the disease occurs repeatedly it is proposed to spray in the fork with Bordeaux mixture as preventive; a Vermorel's cascade sprayer is being obtained for the Department, and arrangements are being made to have these sprayers stocked in this country. There has been up to the present, however, no necessity to put such a method of treatment into force.

The "thread-blight" fungus has been reported on one estate. The fungus has not yet been identified, owing to the absence of spore-bearing organs; to judge from analogy, however, it may be expected to be a species of *Corticium* or *Hypochnus*. It takes the form of white threads which run over the surface of the branches and leaves, causing the younger plants to wither or die:—its effect is not unlike that of a bacterial blight. The disease is spread by means of dead leaves which are blown and lodge against branches, and by the passage of the threads from one branch to another in contact with it. The disease which was present in small amount, was got rid of by pruning off shoots which possessed the threads and by burning them together with all leaves and twigs which has fallen from the trees. A spraying method of treatment is also applicable in this case.

LEAF DISEASE.—*Pestalozzia Guepini*, Desm., and *Phyllosticta Hevea*, Zimmermann, have been observed to cause spots on the leaves, more especially of seedlings. They are few in number and are at present not of any economic importance. *Pestalozzia Guepini* has not yet been observed to attack the stems of seedlings as is said to occur in Ceylon. The plant sheds its leaves and renews them readily; by this habit it possesses a strong power of resistance to leaf diseases.

PHYSIOLOGICAL EFFECTS.—The penetration of the tap root into acid soil or into a heavy, impenetrable clay bottom results in the checking of the growth of the tap root and the rapid shedding of the leaves. The plant, however, responds by expension of the lateral and more superficial roots, and recovers. This occurs on peaty soils and on soils with a heavy clay bottom. The plants grown on such soils possess little or no tap root and are easily blown over by wind.

OTHER EFFECTS—Burrs occurs in some quantity, more especially on old trees. They are referable to two distinct causes. In the one case, they are due to the development of an excess of "wound wood" at points where the knives are allowed to wound the wood tapping; in the other case, they are apparently stimulated by bad tapping, but also occur on untapped trees in small quantity. Those of the first type are prevented by avoiding the wounding of the wood in tapping; while those of the second type, which may attain dimensions measurable by feet and may necessitate the transference of the tapping surface to the upper portions of the trunk, must be removed early when they are young and pea-like and before they fuse up with main wood.

Examples of *Fasciation*, which consists in the development of straw-shaped structures, produced by the fusion of stem and leaves, and which may take the form of antlerlike structures, sometimes occur. though they are rarely met with.—*Agricultural Bulletin of the Straits and Federated Malay States.*

Non-Smoking of Plantation Rubber.

Mr. Joseph T. Wicks writes in the *India Rubber World*:—

At the commencement of a new departure, like the preparation of plantation rubber in Ceylon and the Malay States; it is very important to consider how it should be conducted to suit the requirements of rubber manufacturers of America, England and the Continent.

Now the less the rubber is handled, the better will be its quality. Why should buyers be called on to pay something extra for a process of smoking which is useless, and no doubt initiated by men who are not rubber men, and who know not what is required. A buyer may be asked to pay a few cents. per pound more for a smoked lot of plantation rubber, the rubber being to this extent poorer in quality. Therefore, we, practical experts, say to the planters, don't handle the prepared plantation rubber merely for the sake of handling it; be content, let well alone, only see that you get clean and air-dried rubber.

Rubber cultivators should not attempt to imitate the native Indian manufacture on the banks of the Amazon. Here is a case where what is good and suitable for the region of the Amazon, South America, is absolutely worthless and harmful for Ceylon and Malaya. The conditions, as between East and West, are entirely different. We must not all start to bind our feet because the Chinese do theirs. Ireland might just as well attempt to imitate British Columbia in canning salmon; or London attempt to rival Chicago in packing beef.

The native Indian manufacture of hard cure fine Pará rubber, the production of hams and balls and biscuits by dipping, pouring and smoking is unique, and excites the admiration of practical rubber experts who are accustomed to see through the nature of things.

Between the years 1840 and 1850 the American manufacturers induced the Indians of Brazil to ship to New York unsmoked, or as it was then and is now called virgin rubber. The Indians forwarded some cargoes, but as the virgin rubber was not properly dried, the whey or watery portion of the rubber milk turned sour, and on arrival in New York, the rubber was in a stinking condition. At that time the manufacturers of coats, pillows, beds and air-proof cushions, could not use highly smelling rubber. This happened just prior to the great discovery in America of vulcanization.

As soon as the Indians found that they were not to be paid for Virgin Rubber, they quickly reverted to the smoking process and have adhered with great tenacity to their long tried and approved process of dipping and smoking ever since.

The wonderful skill displayed by the native Indians in their waterproofing of cloaks, the making of shoes, balls, syringes and toy animals, is an object lesson that we rubber experts can appreciate and marvel at the Indian's far-sightedness.

What manufacturers and practical mill managers in the United States and England should demand of planters, cultivators and gatherers in the following:—

(1) Plant and cultivate with all speed.
(2) Cleanliness in collecting plantation rubber.
(3) Let the rubber be fresh air-dried.
(4) Avoid sun-light and exposure to the sun's rays.
(5) Avoid artificial heat.
(6) Eliminate the smoking process.
(7) Eliminate the pressing or blocking process.
(8) The fewer the processes, the greater the strength, therefore, better the quality.
(9) Rid yourself of fads.

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The Scientific Officer.

Mr. R. D. Anstead, B. A., left for Mysore on Wednesday, the 20th instant, to make preliminary arrangements regarding the Planters' section of the Exhibition there. The exhibits that were on show here lately have been despatched to Mysore, and Messrs. Spencer & Co., Ltd., have already sent on the goods required in the Tea and Coffee room. They have also kindly lent a fine spread of bunting.

The Government of India propose to form a Committee to consider measures to guard against the introduction of insect pests and fungoid diseases through the importation of foreign plants into India, and the Inspector-General of Agriculture has suggested that Mr. Anstead might be one of the members of the Committee.

The U. P. A. S. I. Exhibition.

Mention ought to have been made earlier of the new and the two year old Ceará Rubber Seed and the handmade Ceará Rubber, including Smoked Sheet, sent in by Mr. L. E. T. Short, of Maryland, Shevaroys. Mr. Short exhibited also in London this year, and private advices made special allusion to his rubber and seeds, the former being considered excellent.

The International Rubber Exhibition.

In the course of a brief account of The Southern India Stand at the above Exhibition, the *Rubber World* observed :—

" Much of the rubber shown is of very high quality, and the lower grades can hold their own with the same grades produced in Malaya and Ceylon. Of the companies exhibiting, Travancore, Mooply Valley, Stagbrook, Orkaden, and Mundakayam Valley show exceptionally fine Hevea sheet. Rani Travancore exhibits excellent black and white crepe, and the Coorg Estates some very thin Ceará sheet, smoked and unsmoked. Of the private exhibitors, good specimens of Hevea rubber are shown by Mr. J. J. Murphy from his Yendayar estate ; Mr. L. E. T. Short shows some Ceará rubber of high quality from the Maryland estate ; and the Utollular Estate shows Ceará biscuit. It will be gathered from the above list that Southern India is doing well both with Hevea and Manihot, though, of course, the Hevea plantations predominate. Among the many interesting photographs displayed upon the Southern India Stand, there is one which has attracted much attention, illustrating as it does the root growth of the Hevea, and the depth of the soil on a Southern India plantation. There is shown a deep cutting, like a gravel-pit, over which is suspended a Hevea tree with its roots exposed. From the stag roots, which project along the ground near the surface, are thrown down long perpendicular roots corresponding to the tap-root of the trunk."

Scientific Officer's Papers.

No. LXXVIII.—Forking.

My recent Paper on the subject of Roots appears to have revived, in some districts, the old discussion of digging as opposed to non-digging.

A Soil is forked with a twofold object, first of all to open it up and render it friable so that water may penetrate it to a considerable depth, and secondly to expose fresh portions of it again and again to the air and sun in order to aid disintegration. A third reason for forking may be to eliminate weeds. When constantly stirred up and exposed, the soil undergoes chemical and physical changes which render plant food available, and the rain water also aids this process. Heat and Oxygen cause the decomposition of the organic materials in the soil, and the acids set free act upon the insoluble matter and render some of it soluble, and of use to the plant, while the nitrogen of the air feeds some of the organisms in the soil which are indispensable to plant life. Hence, if a soil is not freely permeated by the rain water it cannot be fully productive. Forking alone will not produce in all soils these desirable results, and it is necessary to consider the amount, and the kind of cultivation necessary to retain the friability.

In hilly regions the wash caused by the rain falling on slopes is a serious loss. The top soil containing the valuable bacteria and most of the available plant food is carried away. Forking in such places does not altogether stop wash, contrary to the popular belief. An experiment conducted at the Peradeniya Experiment Station, Ceylon, on methods of stopping wash, showed that the weight of soil carried away from the experimental area, which was average sloping land, during the course of a year with a rainfall of 59 inches was 79 tons per acre on the forked area, as compared with 115 tons per acre on the area which was left bare and exposed. (See *P. C.*, Vol. V, p 431). Hence on slopes forking must be done with care, as seldom as possible, and a cover crop of some sort should be kept on them.

From a scientific point of view the cultivation and tilth produced by digging should be obtained before the crop has grown sufficiently to fill the soil with roots and, after this, roots should not be cut. I believe this to be correct for Coffee, which is essentially a surface rooter. Young clearings should be dug and limed before they are planted, and dug in annually narrowing strips between the rows afterwards; as soon as the process begins to entail the cutting of roots, it should be abandoned for ever and the tilth maintained by means of a surface mulch of leaves, &c. Digging in old coffee should be regarded as a drastic remedial measure, rarely to be adopted, and then only as a last resource on very bad patches where every other kind of treatment has failed.

In the case of Tea, we have a somewhat different problem, for two reasons; first of all the tea is a deep rooted plant, and secondly an army of pluckers are constantly trampling up and down the rows and destroying all the tilth and puddling the soil in the wet weather. The consequence is that a certain amount of digging becomes absolutely necessary as a choice of evils. The soil must be kept in a friable state and easily permeable to water to a considerable depth, and this friability, once it has been obtained, cannot be maintained as in the case of Coffee by covering it with a mulch, because it is constantly destroyed by being trampled down again. Even here, however, there is a limit to the extent to which digging is beneficial, and I think that there is often a tendency to do too much digging in tea rather than too little. No general rule can be laid down of course, because districts and soils differ so much, but the stiffer the soil the more often it must be dug, though in the case of a stiff soil it should never be touched when it is wet. Then again the depth to which the dig is carried is an important factor

to be considered. A deep dig appears to me to be a very dangerous method of dealing with established tea. In carrying it out large roots are cut, and this involves such a shock to the bushes, that it may take them many years to recover their tone. If a deep dig is really considered necessary, it is preferable to do it down alternate rows only. In fact, though necessary in the case of Tea, digging should be carried out so as to cut as few roots as possible.

Petch, in his book on 'The Physiology and Diseases of Hevea brasiliensis,' thus sums up the case for Rubber :—

"The present system of manuring and forking would appear to be open to reconsideration, especially the method of manuring in circles round the tree. Absorption of the manures occurs only through the fine white rootlets and in a six-year-old plantation these will seldom be found within a distance of six feet from the tree. If the trees are planted fifteen feet apart their roots will have crossed by that time, and the manures applied may possibly be taken up by the trees in the next row but one. It would seem that they would be equally available if they were applied in lines between the rows—which would entail less labour—or broadcast, which might be done with less injury to the roots, and would reach a larger number of rootlets. The present system of forking round the tree often entails enormous damage to the roots, especially in close planted areas. Whether this will have any markedly injurious effect on the tree remains to be seen ; but it is certainly open to question whether it is advisable to apply horticultural methods to the cultivation of *Hevea*."

"While forking the soil of a plantation, whether in the course of an application of manures or as an independent method of cultivation, is beneficial to plant growth, there is a considerable difference of opinion as to what actually occurs when a *Hevea* plantation is forked. Many of the roots are broken in the operation, and undoubtedly in fields where the roots are matted, a very large number are damaged. But while some state that this is an advantage, because it causes the tree to put out new feeding rootlets, others declare that the broken roots afford an entrance for the root diseases and white ants. How far the first of these claims is justified remains to be proved, but it would seem a sound principle to require that as little damage as possible should be inflicted. With regard to root diseases, the only fungus likely to attack the broken root, as far as is known at present, is *Botryodiplodia theobromoe*, and there is as yet no recorded instance in which it has done so."

The root Fungus, a *Nectria*, which attacks Pepper and causes the 'Wilt Disease' in Wynaad and Coorg certainly appears to gain a ready entrance into roots which have been damaged by forking, and when Mr. McRae and I investigated this disease in the Wynaad in 1909 we recommended that, "care should be taken about forking round the vines ; if done at all it must be done very lightly so as not to wound the roots, and form points of entry for fungus spores."

It is sometimes contended that forking, with the consequent cutting of roots, is beneficial because it is a 'root pruning.' Any one who has studied the careful system of root pruning carried out on fruit trees in Europe and America will see, however, that breaking the roots by forking can no more be called root pruning, than blindfolding a man armed with a knife and sending him into Tea to slash it indiscriminately could be called 'tea pruning.' It has yet to be proved, moreover, that root pruning, even properly carried out, will produce the same results in the Tropics, where the trees have only a short wintering period, and that during a drought, as it does in Europe, where the wintering takes place over a long period of cold weather when the tree is practically dormant.

RUDOLPH D. ANSTEAD, *Planting Expert.*

Notes and Comments by the Scientific Officer.

132. *Ceará Seed Oil and Poonac.*—The following reports on samples of oil obtained from Ceará seed in Coorg and the residuary poonac have been kindly forwarded by Mr. W. H. Harrison, the Government Agricultural Chemist at Coimbatore:—

"Ceará seed oil was examined and reported upon by Feudler and Kuhn in 1905-06, the results being published in "Chemische Centralbatt 1906, Part I, pages 768-769.

"From the analytical value obtained, this oil would appear to be a drying oil, similar in character to candle-nut, safflower, Poppy seed, and Niger seed oils. It can therefore be used as a substitute for linseed oil in certain directions, and hence could possibly be used in the manufacture of paints and varnishes. Other uses would be as a burning oil and the manufacture of soaps (probably soft soaps).

"The taste of the samples forwarded would probably prevent its use for culinary purposes, but this would probably disappear on suitably refining the oil.

"If the oil could be produced in a large quantity and at a low cost, the best plan would be to enter into communication with oil merchants at home who would be able to advise if there was any opening for its extended use in the arts and manufactures."

Ceará seed Poonac:—"

Moisture	10·96	per cent.
Organic matter	67·05	,,
Sand	3·95	,,
Soluble mineral matter ...	18·04	,,
Total ...	100·00	
Containing Nitrogen	1·72	,,
,, Phosphoric Acid (P_2O_5).	1·96	,,
,, Potash (K_2O)	0·19	,,

Remarks.—The cake is of very low nitrogen content, containing only about one fourth that of ground-nut cake, and one-third that of neem cake, and its market value is therefore proportionately less. It can however be utilized by mixing with other manures rich in Nitrogen, as the organic matter it contains will be useful in producing humus."

133. *Hevea Seed Oil and Poonac.*—*Grenier's Rubber News* of 2nd September, contains a letter from Messrs. Walter Graham & Co. of Greenwich, England, stating that undecorticated Hevea seed was found to contain 20% of oil of a drying nature which they valued at £28 per ton. The residual poonac had the following analysis:—

Moisture	11·52
Oil	6·08
Albuminoids	15·31
Carbohydrates, &c... ...	31·97
Indigestible Fibre	32·54
Mineral matter	2·58
	100·00
Containing Nitrogen ...	2·46

It will be noted, that the samples manufactured by Messrs. Peirce, Leslie & Co. last March, gave a bigger yield of Oil than this and a better poonac on analysis (See *P. C.*, Vol. VI, p. 122).

RUDOLPH D. ANSTEAD, *Planting Expert.*

COFFEE.

In Porto Rico.

Extracts from the Annual Report of the Porto Rico Agricultural Experiment Station for 1910.

There was sold from the island during the year coffee to the value of $5,669,602. Of this amount only $21,876 went to the United States. Naturally a product goes to its best market, and the sales in this instance indicate that our coffee is better appreciated in foreign than in home markets. The cause is not far to seek. Coffee, like other beverages, is rated upon its flavour or aroma. The preference of the people in this regard is largely a matter of training or habit. The trade in an article of uniform quality, as sugar, will change quickly with trade relations, but a variable product, as coffee, changes its lines of trade very slowly.

In most of the countries of Europe and former colonies of Spain as Cuba, the peculiar flavour of Porto Rican coffee is relished. In the States a highly flavoured coffee, as certain classes of Java, has the preference. The Porto Rican coffee is the highest type of after-dinner black coffee. The home market prefers another type. In the States Porto Rican coffee is not properly made. Here the bean is roasted black, in the States it is browned. The method followed here is the proper one for a black after-dinner coffee; that in the States is correct for a highly flavoured coffee where it is desired to preserve the peculiar aroma contained in the essential oil.

It is hard to change the taste of a people, and it is often more profitable to cater to it than to attempt to change it. As long as the present type of coffee is grown in Porto Rico it must be marketed abroad. If the market in the States promises better returns, then the type of coffee that will meet the demands there and command the highest prices must be grown.

Our experiments indicate the possibility of growing Java and other coffees and maintaining their peculiar flavour. It will take more time, however, to determine how these coffees will be received in the States markets. It is necessarily slow to change a product grown on trees owing to the time in which they reach a stage of profitable production. Seeds of introduced varieties of coffee have been distributed, and a number of planters are making practical comparisons with native coffee.

There is a marked improvement in the condition of many plantations, and with the higher prices now ruling, proprietors are giving better cultivation to their trees in both cleaning and pruning and in some instances in fertilization.

There is also a growing tendency to a greater diversification of agricultural products. Planters are finding that other things than coffee pay on the mountains of Porto Rico. Where accessible to roads budded oranges and grape-fruit are being planted and in many instances wild trees have been budded over. Other products, as bananas and charcoal, are being marketed in the near-by towns. This is a move in the right direction, for in a country of small proprietors such as this, the one-crop idea will not succeed.

REPORT OF THE COFFEE EXPERT.

By J. W. Van Leenhoft.

Weather conditions were very unfavourable during the past year at and in the vicinity of the coffee sub-station at La Carmelita. Severe storms during August and November destroyed all hopes for a good crop and for the showing of definite results in the various experiments. The disastrous results of the strong winds could be seen, the soil under and between the

coffee trees being literally covered with small coffee plants sprouted from berries blown from the trees. The berries were larger than last year, and ranged from 300 to 350 berries per liter.

The emajagua, *Paritium tiliaceum* planted for windbreaks, is growing well and will soon be in condition to stand a test, but the pavonia, *Hibiscus rosa sinensis*, could not be planted in sufficient quantities because of the difficulty of procuring seedlings.

The new plantings of Porto Rican and foreign coffees continue to do well, and the crop was again used for distribution free of charge to planters and for cup tests. Several samples roasted here were sent to different persons in the States and on the island. Nearly all reports from the cup trials agree as to the excellency of the Maragogipe coffee.

The United States market has thus far refused to buy Porto Rican coffees, and one of the reasons for this refusal is said to be a bitter taste of the coffee, to which customers in the States object. The removal of this bitter taste would therefore be a valuable improvement and likely to facilitate the introduction of the coffees into the home market. The successful shipping of roasted coffee from here direct to customers in the United States might open a new field for commerce.

A few trees of an exceedingly fine coffee, Mocha or Inhamban, were discovered in the neighbourhood of Mayaguez. Some seeds were collected and planted, with the hope of introducing the cultivation of this fine coffee amongst our planters.

Leaf Weevils are still very much damaged, and experiments for their control have thus far not been successful. The American coffee disease (*Stilbum flavidum*) is rapidly spreading in the vicinity. A special study is being made of this disease by the plant pathologist, and experiments for its control have been begun. Coffee leaf blight and borers in the shade trees continue on the increase, and thus far no means have been found for their control.

Improvement of an old Coffee Grove.

The experiments on the renovation of an old coffee grove were continued, but owing to the heavy losses of berries by storms, no positive results can be shown. From the 9½-acre tract 2,468 pounds of coffee were harvested and marketed. The collection of data on the cost of producing coffee in the improvement plats has been continued.

Cost of producing 100 pounds of coffee in renovating experiments 1910:

Weeding, pruning, etc.	$2·70
Harvesting	1·56
Preparing for market	·60
Freight to market	·39
Total cost per 100 pounds ...	5·25
Average price obtained per 100 pounds	11·03

Experiments with new Planting.

A definite report on the experiments to determine the cost of producing a coffee plantation cannot be presented, for the reason, that the great demand for coffee seed and the large quantities of samples sent out for cup tests made it impossible even approximately to determine the quantity harvested. Besides the seed and samples, there were gathered 163 pounds, which were sold for 18·14.

RUBBER.

A Note on the Canker of Hevea Brasiliensis.

Mr. Keith Bancroft, B. A., Assistant Mycologist, Department of Agriculture, F.M.S., has contributed the following paper to the *Agricultural Bulletin of the Straits and Federated Malay States* :—

The 'canker' of Pará rubber was first investigated by Carruthers in Ceylon in 1903-04. Like the 'canker' of cacao it owes its name rather to the fungus (*Nectria sp.*) to which it was first attributed, than to the effects produced by the disease. On *Hevea* plantations in Ceylon, there has not been much damage caused by 'canker' but in mixed cacao and Hevea cultivations, the disease is regarded as being more serious. Hitherto there has been no record of its occurrence in this country.

The symptoms are the following :—

External symptoms at first are obscure ; on young trees the bark may appear to be a little darker in colour, but on older trees there are no observable external symptoms at the commencement. The first symptom which is usually recorded, is the cessation of the flow of latex ; when this occurs, if the outer bark be scrapped away, a black layer is found under which the latex layer is obviously discoloured. When recently diseased the inner tissues possess a grey or neutral tint with a well defined black border, but in advanced cases of disease they become of a claret or purple colour. In some cases a purplish red liquid is exuded from the diseased parts. These are briefly the symptoms described by Petch in the Circulars and Agricultural Journal, Royal Botanic Gardens, Ceylon, Vol. V. No. 13, 1910.

Cessation of the flow of latex is, however, by no means always a sign of 'canker.' Trees may cease to give latex through overtapping or during periods of drought ; but it is not uncommon to find trees, here and there, which have stopped yielding from other causes, the nature of which it is not easy to determine. Sometimes these trees are poor in foliage and are unhealthy in appearance, but in many cases the cause of the cessation of the flow of latex is obscure. Such trees commence to yield again after some months or even, perhaps, a year. It is, however, desirable that tapping coolies should be made to report at once such trees as cease to yield in order that an examination may be made for the purpose of determining whether the effect is pathological.

The presence of a black border or rim to the diseased tissues, as mentioned above, requires some consideration. The normal colour of the outer tissues of the older bark of *Hevea* is either white, yellowish, light or deep red. In barks which possess a light colour it is not uncommon to find a dark brown layer just external to the latex layer ; this layer may be 1/15 of an inch in width. The presence of this layer has been repeatedly put forward as a sympton of 'canker' by some who have read or heard of the disease. An examination has, however, shown that the cells composing this layer are in a normal condition of health and that the colour is due to the presence of brown colouring matter in the cell-walls.

It has been mentioned above that the disease has not yet been recorded in this country. Ridley has, however, reported a blackening and decay of fruits of Hevea in the Federated Malay States, which he attributed to a species of *Phytophthora*. Petch, in 1905, investigated a blackening of fruits of *Hevea* in Ceylon and attributed it to a *Phytophthora sp.*, now known as *P. Faberi*, Maubl., a fungus which is regarded in the light of recent work by Rorer as the cause of the 'canker,' and pod disease' of cacao. The blackening and decay of *Hevea* fruits was previously recorded

by Carruthers in Ceylon in 1903-4 and was attributed to a new species of *Nectria*, with the spores of which Carruthers claims to have reproduced the 'canker' disease of the stem. Petch examined this fungus in 1906 and described it as a new species, *Nectria diversispora*, which he regarded as a saprophyte. Subsequently Petch described some inoculation experiments with spores of the *Phytophthora*, at wounds made on the trunk of *Hevea*, both by excising a small piece of bark down to the laticiferous tissue without drawing latex and by a slanting cut which did not extend so deep as to cause a flow of latex. Distinct infection was observed after 24 days in three out of five of the first series; but none of the second series showed any sign of infection. The spread of the disease was said to be much slower than on cacao. From these results, Petch concludes that the 'canker' of the stem and the blackening of the fruits is due to *Phitophthora Faberi*, the same fungus which causes the 'canker' and 'pod disease' of cacao.

The 'canker' fungus of *Hevea* requires further careful investigation; it is desirable that a large number of inoculations be performed with the fungus both on the pods and on the stem, for the purpose of establishing with some certainty its effect on the plant. Much remains to be done on the dispersal of the fungus and on its mode of entrance into the host, its capacity for living and reproducing itself on dead parts of the plant and its range of hosts in this country, in order that some accurate knowledge may be obtained of such important factors as the facility with which the disease may be spread by a tapping knife, the capacity of the fungus for passing from the fruits into the young branches with production of disease in them,—in fact in order that some accurate knowledge may be obtained of the methods of treatment which are likely to prove most serviceable in combating the disease.

In view of these considerations, it is proposed during the fruiting season to form an estimate of the amount of the disease in this country, and to carry out such inoculation experiments as will lead to some knowledge of the life-history of the fungus of the disease which has been attributed to it.

Before concluding this note on the 'canker' disease of *Hevea*, it is desirable to refer somewhat briefly to two fungi which occur on *Hevea* in this country, and which are regarded by some as being the cause of a disease to which the name 'canker' is given. One of these fungi, *Nectria diversispora*, has been mentioned above; the other is *Stibella Heveae*. The fact that these two fungi are regarded by some as parasites on *Hevea*, coupled with the fact that they are frequently associated with effects on the tapping surface, which at first appear to be pathological, had led me to make investigations on the two fungi, in order to determine whether they existed merely as saprophytes or whether they were capable of causing any injury to the plant.

Nectria diversispora was originally described by Petch on dead branches of *Hevea* and of *Thea viridis*; it was considered by him to a *saprophyte*. Inoculation experiments described by him in the *Tropical Agriculturist*, December, 1909, served to show the harmless nature of the fungus. In this country the fungus occurs freely on dead twigs and branches of *Hevea*, ou the dead parts of the trunk, and on the wood exposed by the spliting or breaking of the trunks. It takes the form of minute, red points which are sometimes aggregated in large numbers, each individual body being just visible to the naked eye. This is the mature form of the fungus, the *Nectria* stage. This stage is usually preceded by a white mould which is composed of two forms, a *Spicaria*-form, and a *Fusarium*-form.

The ripe ascospores of the *Nectria* were found to germinate in a 1% cane sugar solution in about 24 hours and to give rise to a mycelium which produced the *Spicaria*-form. In plate cultures, on sugar-agar and a 10% extract of the juice of the sugar cane, the *Spicaria*-form appeared in five or six days and almost simultaneously the *Fusarium*-form made its appearance in the cultures. Cultures derived from the conidia of the *Spicaria*-form reproduced the same form in four or five days, and after some weeks the *Fusarium*-form appeared in small quantity. Cultures derived from the *Fusarium*-form produced both the *Spicaria*-form and the *Fusarium*-form simultaneously. Pure cultures were obtained and used for inoculation. The results which attended the progress of the growth in the cultures showed that *Nectria-diversispora* was possessed of two conidial forms and the *Nectria*.

The conidia of the *Fusarium*-form and the *Spicaria*-form were obtained for inoculation from the pure cultures, of which eighteen had been prepared and studied. Three modes of inoculation were employed; one consisted in applying conidia and mycelium from a culture on to the freshly tapped surfaces of healthy four-year-old trees and keeping the surfaces moist for four days; the second consisted in removing small squares of the bark to the depth of the latex layer, allowing the exposed tissues and replacing the square of outer bark in position. The third consisted in cutting by means of an oblique cut down to the wood on the one-month-old and two-month old tapping surface, and transferring conidia and mycelium to the cut surface of the wood. In the two last named methods the trees were healthy and were ten-years of age; control cuts were made on each tree and all of the cuts were kept moist for six days. The ascospores were obtained by crushing ripe perithecia in small quantity of recently boiled distilled water and transferring them to the wounds; they were employed for inoculation in the second and third methods. Altogether eighteen trees were employed, six being used for each of the methods described above; and in the second and the third series each tree was inoculated at three wounds with conidia of the *Spicaria*-form, with conidia of the *Fusarium*-form and with ascospores of the *Nectria*, making nine inoculationrs in each tree. At the end of eight weeks, the inoculations were examined. In those of the first series no effect could be observed on the tapping surface; in those of the second series the wounds were healing, and the squares of the bark which had been replaced in the cuts were being forced out by the healing of the wounds; in those of the third series the wounds were healing well. A further examination at the end of ten weeks failed to show any symptoms of disease. It was concluded that the fungus was incapable of inoculating, either at the newly tapped surface, or at a wound on the trunk. These results serve to corroborate Petch's conclusions as to the harmless nature of the fungus.

Stibella Heveae was described by Zimmermann from Java in 1902 on branches of *Hevea*. This fungus, or a species which in its characters and measurements is indistinguishable from it, occurs commonly on dead parts of *Hevea* similarly to *Nectria diversispora*. It takes the form of pin-like structures, about ½ of an inch long, each consisting of a red stalk and a rounded pink head. The spores germinate readily in a 1% solution of cane sugar and reproduce a white mycelium. Pure cultures were obtained from the spores on agar-agar and a 10% extract of the juice of the sugar cane. The mycelium grows somewhat rapidly, a good growth being obtained in a week. Both the mycelium obtained in pure cultures and the spores taken from the 'heads' of the fruits were used to inoculate ten-year-old trees through cuts which were made on the two-months-old tapping surface. The cuts were of the same two types as in the previous experiments; and

three cuts of each kind were made on each of four trees. At the end of nine weeks an examination showed no signs of disease; while the dead portions of the outer bark, which had been severed in making the wounds, were observed to bear the conidiophores of the fungus, thus showing clearly its saprophytic nature.

Both of these fungi have been found to be associated with an effect on the tapping surface, which at first appeared to be pathological, but which on further investigation was found to be only temporary. This effect has been recorded here and there in isolated cases on several plantations, and on one plantation it was present in some abundance on trees of seven and ten years; it has also been recorded in Ceylon. The newly tapped surface shows it first; here sunken patches make their appearance externally and an examination shows that the bark which should be renewing is dead. If the dead bark be removed, the wood beneath it is found to be discoloured, and the area of discoloured wood is greater than the external surface of dead bark would indicate. The dead area increases in size and the tapped surface may be affected for the whole length of the tapping cut and for a vertical distance of one or one-and-a-half inches. The effect may occur separately on either of the cuts or it may occur simultaneously on all the cuts. After a time the wounds commence to heal over and the effect, which is therefore only temporary, is remedied. There may be, however, considerable damage done by the entrance of boring insects on the dead bark. On the outer, dead bark, a white mould composed of the two conidial forms of *Nectria diversispora* frequently occurs, as also do the sporophores of *Stibella Heveae*.

Repeated attempts to inoculate with the organisms present in the dead tissues have failed; these in addition to the two fungi given above, are species of *Penicillium* and *Aspergillus* and two kinds of bacteria. The fact that the trees are capable of healing after a time is sufficient evidence to show that the initial effect is not due to a parasitic micro-organism. The death and decay of the wood is in all probability due to the entrance and percolation of water containing organisms of decay; and it seems probable that the death of the newly tapped bark at the commencement is due to the presence of an excess of water on the tapping surface. In Ceylon, the effect has only been recorded during the rainy season, and in this country, in the case of the single plantation quoted above, the period of commencement of the trouble corresponded with a period of heavy rains. The occurrence of the effect on either cut independently of the other is regarded as good evidence in support of the belief that it is in no way connected with nutrition or weakness on the part of the plant. In Ceylon, Petch regards it as being due to the accumulation of water on the freshly tapped surface.

When trees show this effect, tapping should be stopped on the affected cuts. A more rapid healing of the wound may be obtained by removing the dead bark, so as to leave a ring of healthy bark around the wound, and by tarring the exposed surface of the wood with coal tar, the tar also serving to keep out borers. It is better to warm the tar before using it; but since in such a case it is more liable to run over the surface of the healthy adjacent bark, it is advisable to recommend the use of the cold tar. Care should be taken to apply the tar to the exposed surface of the wood only.

Growth of Hevea in Java.

The prominence given recently to the cultivation of *Hevea brasiliensis* in the Dutch East Indies has had a peculiar effect on the minds of some investors, who are connected with plantations, especially in the island of Java. I have very frequently, of late, heard opinions expressed which, if

they are likely to prove anything like an accurate forecast, would be discouraging to the majority of investors. I have even heard it said that Java can never compete with other countries in the production of Pará Rubber.

The area under cultivation in Java is sufficiently large to warrant our going into this matter somewhat deeply. Java, it should be remembered, did not commence active planting operations with *Hevea brasiliensis* until the cultivation of that species had been proved a success in Ceylon and Malaya. And the delayed planting of this species in that island is the main cause for the present trend of opinions. While in the British territory the planting of Hevea was being rapidly taken up, in the Dutch East Indies another species, *Ficus elastica*, was being recommended, in preference to all other kinds. It may or may not be too early to say which of the two courses is likely to be the best in the long run, but I think that no one could now entertain any doubt as to the desirability of planting Hevea instead of Ficus in the future.

Another reason why Java has not gained much in favour among rubber investors, is that in the early days of planting in that island, areas were selected which showed an inferiority in soil and climate features. A very large proportion of the planted acreage is at a disadvantage in so far that the rubber trees have not, as in Malaya, been planted on land previously in jungle and therefore richer in plant food. It is now well-known that a very large number of rubber companies in Java are nothing more or less than transformed coffee estates. The soil on these properties has been under cultivation for many years; all who are familiar with the dense root-system of the coffee bush admit that long years of cultivation with that species has a very exhausting effect on the soil constituents. Further in Java, as in practically no other country, the planters appear to be more or less wedded to a system of weed cultivation —otherwise designed as green manuring. This is often done to the detriment of the trees during the first ten years of their existence. While admitting that the inherent nature of the soil and the rainfall are often not of the best for the cultivation of Hevea, I think rather that much of the disappointment can be traced to the fact that the estates have not been planted on recently cleared jungle land, and that these properties when once planted have not been maintained in a clean condition.

The two illustrations here given show that even when the land has been intercropped for many years, Pará rubber trees will grow successfully. In Fig. 1 are depicted trees of *Hevea brasiliensis* planted in 1906-7 at a distance of 14 by 14 feet apart. The Robusta coffee shown in this photograph was planted during 1908-9 at a distance of 7 by 7 feet. The majority of the Pará rubber trees on this particular block can now be said to be ready for tapping, though they are only about 5 years old. This, of course, is much slower growth than one is accustomed to find in Malaya, but it is sufficiently good to warrant the assertion here made that these trees will grow and ultimately produce fairly good plantations. In fig. 2 are shown younger trees planted in 1907-8 at a greater distance apart, *viz.*, 20 by 20 feet. The Robusta was planted in 1909-10 at a distance of 6 by 8 feet.

It will be noticed in these photographs that the land is clean weeded. The soil is of a very friable nature, and there is a marked dry period every year, the climate, in fact, resembling very much that in many parts of Ceylon.

I am now in possession of a number of figures showing the rates of growth of trees of different ages in Java. Four-year-old trees on one pro-

perty, planted 14 by 14 feet, show an average circumference a yard from the ground of from 7 to 20 inches. Others planted 12 by 12 feet show an average girth of from 6 to 13 inches. Other four-year-old trees not far removed from the foregoing had a girth of from 6 to 13 inches. These were planted 20 by 20 feet apart in virgin land, and the estate had been kept clean from the commencement. On the same estate, though the trees were of the same age and planted at the same distance, but on old coffee land and only circle weeded, the girth varied from 5 to 8 inches.

It is certain that during 1912 quite a large number of companies registered in Great Britain will be producing rubber in Java; among these we need only mention Soember Ajoe, Langen, Bantardawa, Bandjarsarie, and Java Rubber Plantations. In the list of yields of rubber companies published in every issue of this journal will also be noticed the crops harvested from Belgische, Javasche, Bantam, Doejan, Java, Pará and other plantations. Though many estates are about to produce rubber, I think one must admit that a smaller annual yield will be obtained during the first few years of tapping operations. This is apparent from the slow rate of growth prevailing in the first few years. Further this is, to a certain extent, an indication of the rate of bark renewal and therefore of rubber production in the future.

Altogether we do not see why Java should not give us an average of one ton per ten acres per annum once the areas now planted have reached their seventh year.

Taken as a whole, labour-costs in many parts of Java are much lower than in Malay, and even compare very favourably in this respect with many estates in Ceylon and South India. There are however, many properties in Java which experience labour difficulties as acutely as do others in Malay, and where the rate of wages is similarly high. During the present year many properties have had trouble in connection with serious diseases among the coolies. These and other factors are perhaps only of passing importance, and may in future years be to a large extent discounted.—*India-Rubber Journal.*

In Bolivia.

H. M. Minister at La Paz reports that, accordiug to the official Bolivian "Revista del Ministerio de Hacienda," the production of Rubber in Bolivia in 1910 amounted to 3,117 metric tons, of which 2,641 tons were obtained in the province of "Territorio Nacional de Colonias" and the Department of the Beni, and the rest in the La Paz and Santa Cruz Departments. The greater part of the rubber, 2.469 metric tons, was exported by way of the Amazon river, smaller quantities going *via* Mollendo, the river Paraguay, Antofagasta and Rosario. As regards the destination of the exports, 1,297 metric tons are given as going to the United Kingdom, 575 tons to Germany, and 825 tons to Brazil. It is estimated that 75 per cent. of the rubber exported from Bolivia is of "fine" quality, and the rest of "ordinary" quality (sernamby and caoutchouc.)

Exports from Mexico in 1910.

The export of rubber, including that made from the guayule shrub, was 8,068 metric tons, valued at £1,710,924, as compared with 6,015 tons, valued at £890,107, in 1908-09, and 5,624 tons, valued at £907,723, in 1907-08. In addition, 5,261 tons of guayule plants, valued at £966,537, were exported as compared with 3,022 tons, value £463,567, in 1908-09, and 1,293 tons, value £125,852, in 1907-08, showing that the rubber production of Mexico has increased very considerably.

SOILS AND FERTILISERS.

Results of Fertilising Wheat with Nitrolim.

Messrs. Peirce, Leslie & Co., Ltd., have very kindly forwarded the subjoined Circular showing the results of Experiments carried out by the Director of Agriculture of the Central Provinces with Nitrolim as a fertiliser for Wheat. These experiments indicate that Nitrolim is an excellent fertiliser for this product, and encourage the hope that it may prove equally beneficial for Coffee and Tea. It should be remembered that Nitrolim is guaranteed to contain 18% of Nitrogen and 24 to 30% of Lime :—

WHEAT UNIRRIGATED ON MARYAR SOIL (1909-1910).

Treatment.	Date of application of manure.	Grain lbs.	Straw lbs.	Value realised per acre.		
Unmanured ...	—	558	648	31	1	10
20 lbs. Nitrogen per acre from NITROLIM ...	16th July 1909.	648	755	36	2	4
40 lbs. Nitrogen per acre from NITROLIM ...	16th July 1909.	710	773	39	5	10
Unmanured ...	—	620	715	34	9	6
20 lbs. Nitrogen per acre...	13th Sept. 1909.	735	830	40	14	5
40 lbs. Nitrogen per acre...	13th Sept. 1909.	805	995	45	3	6

WHEAT IRRIGATED ON MUND L. SOIL (1910-1911).

Treatment.	Grain lbs.	Straw lbs.
Manured with farmyard manure during the previous year..	1,120	1,250
Do. Do. Do. Do. plus 20 lbs. Nitrogen per acre from Nitrolim ...	1,430	1,495

LINSEED UNIRRIGATED ON MARYAR SOIL 1909-1910).

Treatment.	Date of application of manure.	Outturn per acre : lbs.	Value realised per acre.		
Unmanured ...	—	280	18	10	8
20 lbs. Nitrogen per acre form NITROLIM ...	16th July 1909.	305	20	5	4
40 lbs. Nitrogen per acre from NITROLIM ...	16th July 1909.	295	19	10	8
Unmanured ...	—	280	18	10	8
20 lbs. Nitrogen per acre from NITROLIM ...	13th Sept. 1909.	340	22	10	8

COTTON ON MORAND SOIL (1910-1911).

Treatment.	Outturn of seed cotton per acre. lbs.	ozs.
Unmanured	72	0
20 lbs. Nitrogen per acre from Nitrolim ...	110	8

(N.B.—The year 1910-11 was exceptionally unfavourable for cotton).

JWAR ON MORAND SOIL IN (1910-1911).

Treatment.	Outturn per acre Grain.
Unmanured	285 lbs.
NITROLIM 20 lbs. N. per acre	389 ,,

SELECTED CUTTINGS.

Notes on Grafting and Budding.

The following paper by H. F. Macmillan, Curator, Royal Botanic Gardens, Ceylon, has been printed for the *Ceylon Agricultural Society* :—

GRAFTING.

Grafting consists in placing together two cut surfaces of one or different plants in such a way as to cause them to unite and grow together. The plant on which the graft is inserted is called the *stock*, and the part inserted the *scion*. The action of the one on the other is frequently marked and very important. Some fruit trees, for instance, grow freely on a certain stock, but will scarcely bear fruit; whilst on other stock they produce abundant crops, though they may not grow so vigorously. The possibilities of grafting are of the greatest importance in horticulture more especially in fruit-growing industries, and though its medium trees and shrubs, etc., may be propagated when other reproductive means are of no avail. Among other advantages of grafting are: the good qualities of the scion are retained; seedling fruit trees are brought more quickly into bearing by being grafted on fruit-bearing stocks; and in some cases the two sexes of monoecious plants may be brought together on one stock in order to ensure their reproduction by self-fertilization. In Ceylon, however, as in most tropical countries, grafting is seldom practised.

Certain conditions are essential for successful grafting. The scion and stock should have a natural affinity to each other, either as varieties, species, or genera of the same natural order; also the natural vigour of the stock and scion should be somewhat similar. The operation should be carried out in the shade, and protected from the sun until the union is complete. In all cases it is necessary to exclude the air from the graft by covering it with grafting wax or clay, bound round with matting or fibre. A fundamental principle is the necessity of forming a direct communication between the layers of inner bark (cambium) in the scion and stock; the pithy or woody parts do not unite. There are various methods of grafting that may be practised, according to the size and variety of the subject it is intended to propogate or improve, and each method may be varied to some extent. The following are those most generally used :—

Whip-or Tongue-grafting.—This is one of the best methods, and is extensively practised in cool countries. The stock is cut in a sloping direction, just above the node. The scion is then similarly cut through obliquely; a thin tongue is cut in this in an upward direction, and a corresponding cut made in the stock; the scion is fitted into the latter so that the inner barks of stock and scion come into contact with each other. The graft is then bound firmly to keep the parts in position, and covered with clay or grafting wax for excluding the air.

Cleft-grafting.—The stock is split open by a chisel, and the scion cut wedge-shaped and fitted in the cleft, so that the inner barks may meet each other. This mode has obviously certain objections, and is chiefly adopted for plants with old stocks.

Saddle-grafting.—In this the stock and scion must be of nearly equal thickness, as the former is cut sloping on each side, like a wedge, and the latter is split up the centre and thinned so as to allow of it fitting accurately on top of the stock. This method is suited to shrubs and young-wooded plants.

Wedge-grafting.—This is the same as the preceding plan, with the position of parts reserved.

Crown-or Rind-grafting.—is applied to trees of considerable size. A scion, about six inches long, is selected; the lower half is cut in sloping direction, and the notch or shoulder formed in cutting it is made to fit on top of the stock. It is then inserted between the bark and wood. This can only be done at the commencement of the growing season, when the bark and wood easily separate.

Side-grafting.—consists in inserting scions without cutting away the head of the stock. It is useful for supplying, where deficient, a branch or stem to any part of a tree. The scion being splice-cut and thinned out is inserted under the bark, the union being bound up and covered with clay or wax.

Veneer-grafting.—is chiefly used for propagating trees and evergreen shrubs. The scion is cut with an even splice-cut about 1 inch long; a corresponding quantity of bark is taken off the side of the stock; both are then fitted together, without a cleft or incision being made in the wood.

Grafting by approach or Inarching.—This is the best system of graft known, and natural examples are frequently seen in trees growing together. It is specially suited to the tropics, and is successfully applied to mangoes and other fruit trees. Nutmeg, cacao, coffee, &c., may also be propagated in this way. The scion in this case must be grown in a pot or bamboo, so as to be movable, or planted close to the stock. In the case of large trees which it is desired to increase in this way, a temporary platform may be erected near the tree upon which the scion-plants in pots are placed; the shoots of the tree may thus be easily bent down to reach the scion. The mode of procedure for inarching is to remove a similar portion of the wood from both the parts intended for joining; these must then be carefully fitted together and secured with tying material and a bandage. When the parts have united, dissever the union from the parent plant below the bandage. The grafted plant must be kept in a shaded place until it has commenced active growth, and stock and scion have become thoroughly incorporated.

Herbaceous grafting is applicable for increasing plants when still growing. It has been applied with success in growing the melon on the cucumber, the tomato on the potato, &c. The stock and scion being nearly similar in texture, the former is carefully split, and the scion prepared wedge-shaped and inserted rather deeply, allowing the barks to coincide as in all other methods. Tie with worsted, cover the cut with grafting wax, and shade from the sun.

BUDDING.

This process, which is a species of grafting, consists of taking an "eye" or bud attached to a portion of the bark and inserting it in the stem or plant of another plant. A condition necessary to success is that the sap is in active circulation, so that the bark may detach itself readily when gently lifted from the wood. This is found to take place best where very marked seasons of growth or "flushes" occur. In equatorial regions, where the seasons are not so marked as in temperate countries, the operation of budding is not always very successful. There are various forms of budding, each adapted to particular circumstances, as shield or T-budding, flute- or tube-budding, and annular or ring-budding. The first named form is the one chiefly practised for roses and fruit tress. The *modus operandi* is thus. Select a shoot well furnished with plump dormant buds from the plant desired to be increased, cut off the leaves at half of the length of the leafstalks,

Remove a bud from the shoot by entering a knife half an inch below the bud, between the inner bark and the wood, sloping the knife outwards above the bud. The small portion of wood taken with the bud is carefully removed. In the bark of the young shoot in which the bud is to be inserted make an incision in the form of "T." Raise the bark carefully, push the bud gently into the opening, bind it securely to exclude air, leaving only the point of the bud exposed. Dull cloudy weather and morning or evening is the best time for budding and the operation must be performed as quickly as possible, as both bark and the bud are injured if exposed to the air for any length of time. Special knives are supplied for the purpose, and an instrument known as the "bud-transplanter" is also employed.

Firminger said: "In the Upper Provinces of India budding is performed with great facility at two seasons of the year, but for some reason I am unable to explain, I have not found such to be the case in the vicinity of Calcutta, where budding can so seldom be performed with success, that it is rarely or never attempted, inarching being uniformly adopted instead." Mr. Fawcett, retired Director of Botanic Gardens, Jamaica, recommends budding as a quick way of establishing a mango orchard in that country. Mr. Harris of Jamaica has been successful in budding cacao, and found that the Criollo and Calabacillo thus "gained enormously in vigour and productiveness." Budding is applicable to various kinds of fruit trees. In the West Indies it is claimed to have been "so successfully applied to the nutmeg trees, the grafting of which has not proved practicable, that the sexes of these may now be brought under the control of the cultivator." In regard of budding mangoes, the secret of success is said to lie "in taking the buds from about the middle of the growing shoot where they are well developed, and yet not too tender, at a time just prior to a vigorous stage of growth in the tree to be budded.

Bud-grafting.—In Queensland and the Southern United States this form of budding has of late been adopted with great success in the propagation of the mango. It is considered to be much more rapid than "inarching" or "grafting by approach," and does not, like the latter, involve the erection of a structure laden with pots around the tree which is to be multiplied. As applied to the mango, the mode of procedure is thus described; seedlings two to three years old, with stems about an inch in thickness, are selected for stocks. A rectangular piece of bark is removed from the stock, and in its place is inserted a piece similar in shape, with a bud in the centre, taken from the variety of mango which it desired to propagate. The bud-wood *(i.e.,)* the shoot from which the bud is taken) should be not less than two years old. Precision in fitting the bud bark with the incision in the stock are important factors for success. A small quantity of grafting wax should be smeared over the edges of contact, and the bark then tied firmly with strands of bast. . . . After this the graft (excepting the bud) should be covered with the strips of cloth dipped in melted paraffin wax, as a further preventive against the admission of air and moisture between the cut surfaces of stock and scion. If unduly exposed to the sun, shade should be provided by means of strips of paper tied over the bud. After union of stock and scion has taken place (which should be in two or three weeks), the bandaging should be removed, and the stock pruned back.

Grafting clay is a composition for covering the graft to exclude air and moisture until a union of the stock and scion is effected. It consists of two parts clay, and one of cowdung. These ingredients should be beaten together and thoroughly mixed until the consistency of fresh putty some time before being required.

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(INCORPORATED.)

"Tephrosia purpurea."

Owing to prolonged drought, the crop has failed to a great extent, and no fresh supplies can be obtained just now. Endeavours are being made to get seed from new sources, and planters who are likely to require it are requested to communicate with the Secretary at an early date.

Coffea robusta Seed.

A small quantity is in hand, received last week in excess of orders. Planters who are in want of this seed are requested to kindly communicate with the Secretary at an early date. Judging by appearance, the present parcel contains decidedly better seed than that which was imported some months ago.

Rubber Machinery, &c.

Owing to representations made by Mr. J. A. Richardson, several firms of manufacturers of Rubber Machinery &c. have sent out small lots of their catalogues. As far as may be possible, copies will be sent to any planters who may express a desire to have them.

Roads and Communications.

In a G. O. dated August 21, 1911 the Madras Government (Local and Municipal Department) observe :—

"The Government are anxious, so far as their funds permit, to come to the aid of the District Boards desirous of meeting urgent demands for the re-construction of old bridges and the construction of new ones but unable to make the requisite provision solely out of their own resources. Presidents of District Boards are accordingly requested to report what works of this nature are at present most required in their respective districts, with information as to the approximate costs and length of time which the work will involve and the extent to which the Boards can contribute towards the cost. These reports should be accompanied by cross sections of the rivers at the proposed bridge sites, and information as to the nature and depth of subsoil in the river beds, the clear width of roadway required, and the approximate flood discharge. With such data it should be possible for Government to scrutinize the estimates of cost and to determine the nature of the assistance, if any, which can properly be offered. The Government are not prepared to commit themselves to unlimited expenditure on this account, and only in special cases will they make any grant exceeding one half the cost of the work. Care must therefore be taken to limit the applications for help to items of real necessity and urgency, and estimates of cost must be framed with sufficient accuracy to ensure that extravagant and unreasonable claims are not put forward."

Scientific Officer's Papers.

No. XXIX.—The Influence of Light upon Tree Growth.

Bulletin No. 92 of the Forest Service of the United States Department of Agriculture deals with the subject of 'Light in Relation to Tree Growth,' and brings together the principal facts with regard to the part which light plays in the life of the forest, and the different methods of measuring it. Though dealing primarily with Forests, the Bulletin contains much information of value to planters confronted with Shade problems, and it is hoped that the following extracts from it will prove of interest. The subject is of interest to Rubber planters, embracing as it does the much debated question of the distance apart trees should be planted, and of interest also to Coffee planters, since they deal with Shade and its many problems, the difficulty of raising young trees under existing shade to finally take its place being by no means the least of these.

In the Introduction to the Bulletin the use of light to the tree is described :—

" Light is indispensable for the life and growth of trees. In common with other green plants a tree, in order to live, must produce organic substance for the building of new tissues. Certain low forms of vegetable life, such as bacteria and fungi, do not require light. They exist by absorbing organic substance from other living bodies ; but the higher forms of plants manufacture their own organic material by extracting carbon from the air. The leaves, through the agency of their chlorophyll, or green colouring matter, absorb from the air carbon dioxide, and give off a nearly equal volume of oxygen. The carbon dioxide is then broken up into its elements and converted into organic substances which are used in building new tissues.

" Light is not only indispensable for photosynthesis, but it is essential for the formation of chlorophyll itself. Only in exceptional cases, as in the embryo of fir, pine, and cedar seeds, does chlorophyll form in the dark, and, with the exception of some microbes, the green cell is the only place where organic material is built up from inorganic substances.

" Light also influences transpiration, and consequently the metabolism of green plants. It influences largely the structure, the form and the colour of the leaf, and the form of the stem and the crown of the tree. In the forest it largely determines the height growth of trees, the rate at which stands thin out with age, the progress of natural pruning, the character of the living ground cover, the vigor of young tree growth, the existence of several-storied forests, and many other phenomena upon which the management of forests depends. A thorough understanding, therefore, of the effect of light upon the life of individual trees, and especially on trees in the forest, and a knowledge of the methods by which the extent of this effect can be determined are essential for successful cultural operations in the forest."

A Rubber plantation by the time it is eight years old, and a Coffee Estate with old, well established, shade trees, have much in common with forest proper, and in considering light with reference to tree growth, a distinction must be made between direct sunlight and diffused daylight. The latter decreases with altitude while the former increases.

" Trees in the forest make use chiefly of the diffused skylight, and for this reason it plays the most important part in their life. Indeed, many plants have developed special contrivances for protecting themselves from the direct rays of the sun. There are, however, trees and other plants

which, in addition to diffused light, need direct light either during their entire life or during a definite period of their life, as, for instance, during the period of flowering and leafing. Thus, the opening of the buds in many trees proceeds much faster when the tree is exposed not only to diffused light, but also to the direct rays of the sun. Therefore, in determining the effect of light on vegetative processes, it may be essential to know what protion of the entire light affecting the tree is diffused and what is direct.

"Both direct sunlight and diffused light decreases with increase in latitude, but not in the same proportion. The intensity of direct sunlight decreases much more rapidly with increase in latitude than does the intensity of diffused or skylight."

Bunsen and Roscoe estimated the total chemical intensity of sunlight and skylight combined at the latitude of Bombay to be 661, as compared with 20 at the Pole on the one hand, and 716 at the Equator on the other. All the light received by the trees is not direct however.

"The light which reaches the crowns of trees from above is called overhead light. This determines the arrangement of leaves on the shoots, their position in relation to the sun, and the arrangement of the branches. It is the strongest light, whether it consists of either direct or diffused light alone or both together. In the case of dominant trees it equals the total daylight.

"The light which reaches the crowns of trees from the side is called side light. It stimulates the development of buds on the lateral branches and is responsible for the development of the branches facing an opening in the forest.

"In the case of trees growing near a wall or steep slope the tree may receive light which is reflected back upon the tree and is called reflected side light.

"In some cases especially where trees are growing near bodies of water, or from the water's surface. This is called reflected ground light, and is not so insignificant as it may appear at first thought. Thus, actual measurements have shown that, at a height of 1 meter ($3\frac{1}{4}$ feet) the intensity of light reflected from a road illumined by the sun may be 1/12 of the overhead light intensity; the intensity of light reflected from the water's surface may amount to 1/6 of the overhead light intensity, measured at a height of about 5 feet from the surface."

That a certain minimum of light is necessary for the growth of a leaf or a plant is well known, and some kinds of plants require more light than others; plants are shade loving or the reverse.—

"The minimum intensity of light in which photosynthesis can take place is not sufficiently determined for all species; it differs in different species with the sensitiveness of the chloroplasts. Trees not only accumulate energy by building up new organic substance, but they also expend energy from the organic substance which they produce. This expenditure of energy is accompanied by oxidation of carbon and exhaling carbon dioxide, or respiration. As long as the light intensity is above the necessary minimum for the given species, the process of assimilating carbon from the air, and thus building up new organic substance, goes on with greater energy than the opposite process of breaking up organic substance and giving off carbon into the air in the form of carbon dioxide. As the light intensity decreases the assimilation decreases correspondingly, and the amount of carbon assimilated from the air approaches the amount given off by respi-

ration. As soon as the energy of assimilation falls so low that the amount of carbon assimilated is less than that needed for the maintenance of respiration the leaf dies."

The minimum intensity of light has an important bearing upon the question of weeds and cover crops. When the shade beneath the trees reaches a certain density, all green vegetation disappears and nothing can be induced to grow.—

"The minimum light intensity at which green vegetation disappears from under the shade of trees in the forest varies considerably with the climate. Thus, in the Temperate Zone, no green vegetation occurs in the shade where the light is only 1/70 of the total daylight. In the Tropics, the last vestige of green vegetation disappears from under the cover when the minimum light intensity falls to 1/120 of the total daylight."

All these factors must play their part in the growth of Rubber plantations and Coffee shade, and they would doubtless repay investigation.

Another interesting point is dealt with in this Bulletin, the effect of the competition of the roots of existing trees on seedlings and supplies. It is notorious that it is difficult to bring on supplies in existing plantations, whether they are Coffee, Tea, or Rubber, and the authors suggest, and quote some experimental results to prove, that this may be due to the root competition more than to shade.

"On fresh soils, with an abundant supply of moisture, root competition affects the growth of the seedlings only a little or not at all, and for this reason, it is assumed that trees are more tolerant on fresh or moist soils than on dry soils. But even on the same kind of soil the effect of trees of different species upon the growth of seedlings is not the same. Trees with a strongly developed superficial-root system naturally desiccate the upper layers of the soil much more than trees with a compact, deep-root system.

"In filling fail places in plantations, the competition of the roots determines the success or failure of the operation. It happens only too often that the planting of fail places on dry or only moderately fresh soils meets with entire failure, because growth of the new seedlings is impossible in the dry soil produced by the roots of the older seedlings, which in the porous soils of the planting holes attain extra good development. In dry situations, therefore, fail places must be filled not later than three years after the first planting; otherwise it will be necessary to give up entirely the filling of the blank places, or the older competitors must be removed from small areas and these then replanted."

In a Pine forest patches which had to be planted up with supplies were surrounded by a trench 10 inches deep and all the roots from the neighbouring trees were cut through to the depth of the trenches. The result was remarkable, not only did the supplies make a rapid growth, but "the old trees whose superficial roots were cut through apparently did not suffer and none of them were uprooted by the wind. On the areas inside the trenches a rich flora sprung up during the first summer," containing weeds which did not appear in the areas outside the trenches.

This is a 'tip' which might prove useful on some Coffee estates where patches refuse to grow supplies.

RUDOLPH D. ANSTEAD,
Planting Expert.

Notes and Comments by the Scientific Officer.

134. *The Effect of Pruning on the Root System*:—There appears to be a belief among some planters that if a branch of a tree is cut off, a corresponding portion of the root system will die. This is an erroneous view and has been dealt with by Mr. Balfour in the course of a Report he was asked to make on the pruning of the trees in Pall Mall, a report which appeared in a recent number of the *Gardeners' Chronicle*. In dealing with this point Mr. Balfour says :—

"The old theory, contradicted by the operations of coppicing and pollarding, that there is an absolute co-relation between the root system and the branch system of a tree, in consequence of which the removal of a branch implies the death of the co-related root, appears to have adherents still. The science of the matter is really this :—'The roots depend for the elaborated food material they require for growth upon the area of green assimilating surface exposed by the epigeous portions of the tree to the air, these in their turn, depend for water and mineral salts upon the area of absorbing hairs upon the root tips. There is no necessary relation between any definite areas in the two regions above and below ground; the colonial organisation of the plant secures the service of every active cell for the interest of all others. Shoot pruning does not kill roots. The disastrous results that follow over-pruning and, no less, bad pruning of trees arise not from the death of roots, but from the difficiency of 'branches d'appel' in our less flexible language 'water-lifters'—which are the agents for the efficient distribution of the supply of the water and salts from the intake in the root. Given adequacy in respect of these, all else in the nutritive processes will follow; for the tree, extravagant though it may appear in its output of branches, which are crowded and cumber it, is essentially thrifty in accumulating during opportunity vast stores of reserve food material upon which indent is made for repair and the evolution of new shoots provided the water supply be sufficient."

135. *Black Rot of Coffee*.—In the Annual Report of the Porto Rico Agricultural Experiment Station for 1910, the Pathologist has a note upon Black Rot caused by the fungus *Pellicularia koleroga*, and though it does not tell us much that we do not know it is quoted here as of interest. Tentative experiments here have shown that spraying with Bordeaux Mixture would probably control the disease, but were abandoned as being too expensive:—

"The leaf blight of coffee caused by *Pellicularia koleroga* has been studied during the past year. Especial attention was paid to the life history of the fungus. No ascus-bearing stage was found nor any evidence ot propagation by spores. A slow but effective spread of the disease takes place by the dropping of the leaves carrying the mycelium or their transportation by the wind to healthy trees, each infested leaf being a source of infection. The fungus makes rapid growth during the season of abundant rainfall, but with the dry season its growth stops, and it gradually dries up and falls away leaving the trees comparatively clean. Small fragments remain, however, and from these growth is again made when sufficient water is available. It is at the close of such periods of drought that sprayings can be made most successfully. In experiments made here during the past season, various fungicides were tested as sprays, several with favourable results. Bordeaux mixture was found to be best, owing to its adhering better to the foliage. Spraying, together with cultural methods, such as careful prunings and the avoidance of too close plantings, promises to control this disease effectually.

RUDOLPH D. ANSTEAD, *Planting Expert*.

CORRESPONDENCE.

Labour.

Dear Sir,—The fully recognized importance of the labour position is my excuse for asking you to give some space to the following facts and figures :—

During 1909 the actual number of immigrants admitted to the port of Penang was 83,723, which is 50% higher than during the preceding year. Indentured coolies 2,523, unindentured coolies 56,002, while the remainder 25,198 were traders. Of the total number, 51,000 is the estimated number of arrivals in the Federated Malay States, and the balance presumably landed at Penang for other parts of the Peninsula, but this balance does not include anything like the total coolies who went from S. India to the Crown Colony of the Malay Straits, landing at Malacca, Singapore and other parts for which I have not been able to get figures. The number of deck passengers from Penang to South India in 1910 was 39,080, and of these 22,000 are estimated to have left the F. M. S. The average number of deck passengers on the B. I. immigrant ships from South India was 1,610 per trip and the average number returning was 751. *State aided* passages for labourers emigrating from S. I. numbered 60,742, as against 25,325, in 1909. At the end of the year the recruiting of indentured Tamils was entirely discontinued and it is not proposed to renew it.

N. B. It pays our competitors to have free labour not under any kind of contract.

Mr. L. H. Clayton, Superintendent of Immigrants for the F. M. S., from whose report I take the above figures, says :—

"So far as can be judged by the number of coolies that have come over during the first two months of the current year, there is likely to be a further increase in number in 1911, and I see no reason for altering the opinion expressed in the annual Report of this Department for 1908, that there will not be any serious difficulty in obtaining as much labour as is required from Southern India, provided always that planters are careful to steer clear of profesional recruiters, both European and Native. The commissions paid by many estates to their kanganies per coolie recruited is in many cases far too high. I am decidedly of opinion that if a kangany working on legitimate lines cannot get coolies for seven or eight rupees, he cannot get them at all. To pay a kangany more than this is a direct inducement to him to deal with professional recruiters instead of taking the trouble to collect coolies for himself, and except in the case of a newly started estate it may be taken as certain that a high commission to the kanganies implies mismanagement somewhere. The recruiting of coolies by this Department has practically ceased, only a very few unindentured coolies coming over in each week. If, however, it should be found that many estates are getting their coolies through professional recruiters, it may be necessary for the Department to resume operations, as professional recruiters require careful supervision."

So the undesirability of the professional recruiter is recognized.

On the question of *legislation*, the trend of future events may be judged from the fact that Act VI, so far as Assam is concerned, will cease to exist from July 1st, 1913. Be it remembered that this is the Act on which is founded Act I of 1903 of the Madras Government.

I take the following from the "Home and Colonial Mail" of September 1st, quoting the letter of a planter correspondent of the *Englishman* (date not mentioned, but presumably the 1st week of August or thereabouts.) :—

"As I have said, nothing definite will be given out till after the General Meeting of the Tea Association, but from what one can gather from the committee meetings, the advice Government seems to be prepared to give is —'make Assam a more popular place for emigrants.'"

The sooner we take the lesson to heart the better; do without legislation, and make our estates more popular for coolies.

Surely it is only common-sense.

AYLMER MARTIN.

20—9—11.

EXPORTS OF TEA FROM JAPAN IN 1910.

According to a consular report, the total export of the 1910 tea season is a little over 38,000,000 lbs., an increase of about 2,500,000 lbs. over the previous season. It is interesting to note that whilst the export from Shimizu has increased by 5,000,000 lbs. and that from Yokkaichi by 500,000 lbs., the shipments from the two older ports of Kobe and Yokohama have decreased by 1,000,000 and 2,000,000 lbs. respectively. Moreover, it seems more than likely that the exports from Yokohama and Kobe will decrease still further, whilst the two newer ports will undoubtedly ship larger quantities each year.

The season opened on May 3, but teas did not commence to arrive in any quantity before May 7, and instead of lower prices, as had been expected by everyone, the opening quotations were fully up to those of the previous year. A sharp advance of from 2 to 4 yen per picul occurred within a few days and was maintained throughout the season.

Although there had been no late frosts to spoil the crop, the unusually cool spring weather retarded the growth of the leaves, delaying picking from a week to 10 days. This delay naturally had a hardening effect upon prices. Then later on in the summer, when prices should have come down somewhat owing to the abundant crop, the severe rains with the resulting floods put a complete stop to picking operations in the affected districts, and no fresh supplies being available, the markets soon became bare. When after some days, fresh arrivals were offered for sale, prices at once hardened and all hopes of lower quotations had to be abandoned.

Cup quality for the season was on the whole very fair, but the quality of the leaf was again inferior to that of the previous season, showing bad rolling and careless preparation. The machines which are now extensively used for rolling the raw tea require considerable improvement before they can turn out leaf equal to the old hand-rolled product. Moreover, they appear to break up the tea, so that there is now always a lot of broken leaf and flake mixed even in high grade teas, thus adding materially to their cost and making execution of orders based on the previous season's standards exceedingly difficult.

There was again an increase in the number of American buyers and brokers, who came to Shidzuoka to obtain their requirements, direct from the Japanese firers, and, having no fixed channel through which their goods were obtainable, they were continually forced in competition with each other to pay unnecessarily high prices. This factor, which is more likely to increase than diminish each season, will go a very long way towards preventing prices returning to a reasonable basis, the prevailing quotations being out of all proportion to the value of the teas compared with those produced in other countries.

RUBBER.

Future of the Rubber Industry in the Congo.

The following particulars regarding the rubber industry in the Congo State have been furnished by H. M. Consul at Boma (Mr. H. G. Mackie):—

CULTIVATED RUBBER.—The experimental cultivation of *Hevea brasiliensis*, *Funtumia elastica* and *Manihot Glaziovii* is being continued on a much enlarged scale on the plantations already in existence, and extensive new areas are about to be brought under cultivation. A number of the larger plantations, equipped with mechanical appliances for coagulating the latex, are being devoted to the exclusive cultivation of *Hevea brasiliensis*; while many of the smaller plantations, entailing useless outlay in their upkeep, have been abandoned. About 1,000 hectares (2,470 acres) have recently been planted with *Hevea*. These plantations occur at Musa, Likimi, Dundusana, Mobwasa and Yambata in the Bangala district, Waka and Woma in the Equator district, Kambuya and Avakubi in the Stanleyville district, and Bokala in the Middle Congo. Of *Funtumia elastica*, or the Ireh rubber tree, the most common in the Congo, there are some 3,461,000 trees, of which the greater part are reported to be thriving satisfactorily. The older trees of seven to nine years that have been tapped have yielded a rubber of good quality that commanded a price in the Antwerp market ranging between 17 and 20 frs. per kilog. (6*s*. and 7*s*. 3*d*. per lb.) The present yield of the six year old trees is said to be 100 grammes, which would represent a return of 62½ kilogs. per hectare of 625 trees.

Hevea brasiliensis, first introduced to the Congo by private initiative, is now being adopted by the Government as a most promising plant, adaptable to the climatic conditions and inferiority of soil, and maturing rapidly. The Government have planted 30,000 trees of this species, and have ordered seven extensive areas in the Bangala and Equator districts to be brought under the cultivation.

In view of the higher prices commanded by *Manihot Glaziovii* and the advantages that are claimed for this tree over *Funtumia elastica*, the Government have decided to give extensive impetus to its cultivation. This rubber, experimentally produced in the Congo, has fetched 23 francs per kilog. (about 8*s*. 4*d*. per lb.) in Antwerp on account of its excellent quality. Up to the present, experiments with *Manihot Glaziovii* have been conducted at some twenty government posts, the plants numbering about 185,200: the results are considered to be encouraging.

Experiments are also in progress with other species of rubber plants such as *Castilloa*, various species of *Manihot* and *Ficus*, as well as a latex-yielding *Euphorbia* introduced from Central America. Attention will also be given to the old rubber lianas, of which some 11,000,000 are known to exist. It is believed these lianas will yield an appreciable quantity of rubber in the space of a few years, but that the up-keep of plantations of less than 50,000 lianas will not pay.

As soon as the tapping of the trees becomes practicable, it is proposed to conduct the industry on scientific lines such as those obtaining in Malaysia, particular attention being paid to the process of coagulation, washing and drying, for which the most approved plant will be acquired. The smoke-drying system in vogue in Brazil is likewise being considered with a view to its adoption in the Congo.

Visiting a number of rubber plantations including the botanical gardens at Eala, H. M. Consul was struck by the great number of trees that had been uprooted by the winds, apparently on acount of some deficiency in the soil that stunts the sub-soil development of the tree. Other trees were perishing owing to the ravages of an insect known as the borer, while from conversations with botanists it would appear that *Funtumia elastica* does not yield much latex after the first tapping. These signs coupled with the fact that though this industry is 10 or more years old, there have been no exports of cultivated rubber beyond a few trial shipments, seem somewhat discouraging. Hopes are now, however, being centred upon *Manihot Glaziovii*, which yields an excellent rubber; this too, however, has not yet emerged from an experiment stage of development.

WILD RUBBER.—Among the numerous latex-yielding plants to be found in the vast forest lands of the Congo, the most common are those mentioned below.

Landolphia owariensis, which is perhaps the best known liana, is spread throughout the rubber areas of the country. It is a vigorous vine, and the result of a test made by a botanist, shows that a liana of this species, having a circumference of 18 inches at a height of 3 feet above the ground; produced 31·7 ozs. of latex at the first tapping and 1·65 ozs. at the second, thus giving an annual yield of 33·35 ozs.

Landolphia Klainei, and *Clitandra Arnoldiana* (C. orientalis) are widely scattered throughout the Lower and Middle Congo, the Kasai, Kwango and the Ubangi. The former produces an excellent black rubber when the latex is immersed in boiling water, and experiments with the latter have yielded good results.

Garpodinus gracilis, of which the rhizomes yield a good quality rubber.

Landolphia droogmansiana, which attains a great height and considerable thickness, is best known in the Mayumbe, where it is worked.

Landolphia Tollonii is best known in the Kasai. It grows in a sandy soil, and is remarkable for the extraordinary development of the rhizomes, which measure $\frac{3}{5}$-inch in diameter, and are interwoven in large mesh-like clusters below the surface.

Carpodinus Gentilii is a liana that attains some 12 inches in circumference. It is best known in the Bangala, Uele, and other districts to the north of the equator.

Wild rubber, in districts in which it has been worked on an extensive scale, is now becoming scarce in places. Many of the large rubber zones have been worked out completely, and the industry is at a standstill until the forests shall have had time to recover. Some of the plants, such as *Landolphia Klained* and *Clitandra Arnoldiana*, are known to have attained 50 ft. in height and 4'-5 in. in circumference in four years, but expert opinion differs too widely to allow of any estimation of the period of growth of wild rubber, which it is supposed may be anything between 25 and 50 years. There are, of course, still vast areas of virgin rubber forest, but these are at remote distances from the present lines of communication, and are consequently difficult of access and unprofitable owing to the lack of means of transport. In some of the remaining accessible districts where rubber is still plentiful, labour difficulties have interfered with the progress of the industry. Rubber is now cultivated in other countries by such improved methods as to threaten, in course of time, to displace the inferior wild product on the market.

SOILS AND FERTILISERS.

Nitrogen-Gathering Plants.

Mr. Karl F. Kellerman, Physiologist in Charge of Soil-Bacteriology and Water-Purification, Investigations, Bureau of Plant Industry, has contributed the following paper to the year book of the Department of Agriculture, U. S. A :—

INTRODUCTION.

During the nineteenth century it was the pastime of scientists of a statistical turn of mind to calculate the probable date of the exhaustion of the world's supply of combined nitrogen. Earlier investigations had shown that crop plants could not use the nitrogen of the air and that they required for their growth large quantities combined nittrogen, by which is meant nitrogen chemically united with other elements and thus forming ammonia, nitrates, etc. At this time it was known further that there were constantly in action many processes by which nitrogen could be released from its combined state and added to the supposedly useless supply of gaseous nitrogen in the atmosphere. No methods or processes for changing large quantities of nitrogen gas into forms available for plant food were known, and as it was recognised that animal life was absolutely dependent upon the vigorous continuation of plant life, one can appreciate the point of view of the alarmists, who believed that within a century the then existing supply of available combined nitrogen of the world would be exhausted, and that all the living beings upon the earth would starve to death.

Fortunately for our peace of mind, the last two decades have witnessed so many advances in the knowledge of the natural processes for the maintenance of available combined nitrogen, as well as the discovery and development of practical artificial processes for fixing or combining with other elements the nitrogen of the air in forms suitable for use as fertilizers, that the question of the nitrogen supply for our agricultural land is no longer a bogey with which to scare the rising generation.

There is no doubt that as much combined nitrogen as is desirable can be constantly at the command of the farmer. The methods for maintaining the proper supply on the most economical basis, both at the present time and also considering the necessity of maintaining the fertility of the soil, are now the problems before the agricultural specialist. It is evident that as yet the knowledge in this field is incomplete, and it is believed that conclusions regarding the best farm practice depend upon extending the scope of investigation to include not only the present agricultural crops, but also those plants which are generally considered useless or unimportant.

THE DIFFERENT GROUPS OF NITROGEN-GATHERING PLANTS.

Everyone is now more or less familiar with the ability of clovers, vetches, peas, and other members of the *Leguminosae* that bear symbiotic bacterial nodules upon their roots to fix and utilize as food the nitrogen of the air. It is less generally known that certain other plants, entirely distinct from the *Leguminosae*, also bear symbiotic bacterial root nodules and have nitrogen-gathering properties. As a matter of fact, the nitrogen-gathering property of all these plants is due to the bacteria of their root nodules, or, to speak with scientific accuracy, the bacteria themselves are the nitrogen-gathering plants; from our present knowledge it seems safe to assume that a few species of bacteria and perhaps a few species of fungi and algae are the only plants which have the power to fix atmospheric or gaseous nitrogen and make it available for plant food for the higher plants.

All of these microscopic plants are undoubtedly of economic importance, although it is possible that the three types which excel in nitrogen-fixing ability, are the species of Clostridium, which fix nitrogen when given the proper food and deprived of oxygen; the species of Azotobacter, which fix nitrogen when supplied with oxygen as well as suitable food; and the bacteria of the symbiotic root nodules, which usually have a slight power of fixing nitrogen when supplied with oxygen and suitable food, but which reach their greatest effectiveness in manufacturing plant food from the nitrogen of the air when growing in the nodules, on the roots of higher plants.

The Different Types of Root Nodules.

It is usually considered that slightly different varieties of a single species of bacterium produce the nodules upon the different species of the Leguminosae, respectively, and curiously enough it seems that additional varieties of the same species of bacterium performs similar functions for the non-leguminous plants which are supplied with nitrogen-fixing root nodules.

A comparison of the nitrogen-fixing nodules found upon the roots of different plants is interesting. It must be remembered that the nodules are in reality roots or rootlets which, because of the presence of the nitrogen-fixing bacteria within their cells, have developed abnormally to form the characteristic swollen root tubercles or nitrogen-gathering nodules instead of the ordinary form of root. It is to be expected, as each kind of plant has a slightly different root development, that the root nodules will develop in a correspondingly typical manner. As a matter of fact the nitrogen-fixing root nodule of any kind of plant is almost as definite and characteristic for that plant as any morphological point of differentiation, such as the shape of the leaves or the arrangement of the leaves on the stem.

. . . . The different types of nodules found in the Leguminosae vary from solitary, small, round forms to large, lobed and clustered ones. The small spherical or club-shaped and somewhat lobed nodules . . . . are characteristic of red clover (*Trifolium pratense* L.), white clover (T. *repens* L.), alsike clover (T. *hybridum* L.), and crimson clover (T. *incarnatum* L.). The typical form of these species is the lobed club shape. The simple club shape occurs on the smaller roots, and is the intermediate stage between the small spheres and the fully developed lobed club-shaped or fan-shaped forms, while the small spheres are merely young and undeveloped nodules. A somewhat similar nodule is found upon the roots of alfalfa (*Medicago sativa* L.), sweet clover (*Melilotus alba* Desv.), and bur clover (*Medicago arabica* (L) All.), yet here . . . . the club forms are usually longer and more branched. Often the branched lobes resemble the outstretched fingers of a hand. A third variety of the club shape is found on the roots of garden peas (*Pisum sativum* L.), field peas (P. *arvens* L.), sweet peas (*Latyrus odoratus* L.), hairy vetch (*Vicia hirsuta* S. F. Gray), common vetch (V. *sativa* L.), and one of the acacias (*Acacia dealbata* Link.) There is little chance, however, of confusing this type with the two types previously described; . . . . the branching of the lobes is less decided and both the lobes and the entire nodules are larger and coarser in appearance.

The spherical nodule is perhaps the most common form; . . . . it is found upon the roots of the cowpea (*Vigna unguiculata* (L) Walp.), locust (*Robinia pseudacacia* L.), lima bean (*Phaseolus lunatus* L.), garden bean (P. *vulgaris* L.), mung bean (P. *radiatus* L.), peanut (*Arachis hypogoea* L.), and some of the acacias (*Acacia latifolia* Benth. and A. *esterhazia* Mackay). The nodules of the roots of the

soy bean (*Glycine hispida* (Moench) Maxim.) are spherical, but they are usually distinguished from those of other plants by the slight parallel ridges or stripes upon the surface. The nodules of the yellow lupine (*Lupinus luteus* L.), though fundamentally of the spherical type, are usually found to be angular or irregular in outline. The bean-shaped nodule shown in plate X, figures 1 to 5, is found upon the roots of the majority of the acacias (*Acacia armata R.* Br.. *A. farnesiana* Willd.,) the horse bean (*Vicia faba* L.), and the Tangier pea (*Lathyrus tingitanus* L.) Though the shape of the nodules is very nearly the same, it shonld be noted that the surface of those upon the roots of the Tangier pea is peculiarly rough and uneven, and in fact, in mature nodules may be almost spiny. The largest nodules known at the present time occur upon the roots of the velvet bean (*Stizolobium deeringianum* Bort.). They are often found almost equal in size to the baseball, but . . . . they are as characteristic in general appearances as they are remarkable for their size. The entire nodule is a compact cluster of thick branches, but the branches are so tightly pressed together, except near the periphery, that upon casual inspection one would suppose the nodules to be solid spheres studded with wartlike outgrowths.

The nodules described in the preceding paragraphs all occur upon the roots of different representatives of the Leguminosae. . . . . The nodule of the alder (*Alnus crispa* (Ait) Pursh.) . . . . is very much the same in outline as the type found upon alfalfa, sweet clover, etc. It is always dark coloured, however, and specially in the central and older portions is of a hard and woody texture. The same description would apply to the nodules on the New Jersey tea *Ceanothus americanus* L.), ... as well as to those of the buffalo berry (*Lepargyrea canadensis* (L) Greene) and silver berry (*Eleagnus argentea Pursh.*) . . . . The nodules of the mountain balm (*Ceanothus velutinus* Doul.) . . . . and of the sweet fern (*Comptonia peregrina* (L) Coulter) are very similar to those found upon the vetches, sweet pea, garden pea, etc., though, as in the case of the alder, the texture of the nodule is much more woody than those upon the roots of the *Leguminosae.*

The nodules of several representatives of the *Cycadaceae* are shown in Plate XIII, figure 2, and in Plate XIV, figures 1 and 3. In view of the variation in type among other families and genera the similarity of the nodules of these plants is very striking. They are all fundamentally of the branched vetch or velvet-bean type, though considerable difference is shown in the shape and form of the branches. No one could mistake the nodule *Encephalartos villosus* Lem., for instance, for that of *Cycas circinalis* L., yet any of those nodules would be recognised as belonging to the *Cycadaceae* Some investigators would question the inclusion in this category of the nodules of the *Cycadaceae*. Nitrogen-fixing bacteria, apparently similar to the bacteria isolated from the *Leguminosae*, have been isolated from various *Cycadaceae*, as well as from the other nonlegumes shown in Plate XI, XII, and XIII, however, and it seems reasonable to consider different varieties of this organism the casual and essential agent of the symbiotic root nodules thus far discovered. It is true that the *Cycadaceae* have at present no agricultural significance, whatever value they may have for present investigations will be comparative and will depend upon the possibility of learning the rôle which they played historically in the maintenance of the nitrogen supply.

THE RELATION OF NITROGEN-FIXING PLANTS TO THE POTENTIAL SUPPLY OF NITROGEN.

From the point of view of the modern agronomist it is necessary to consider the nitrogen supply of any field as divided in quantities which are

in available form for plant food and those not in immediately available form; it is further necessary to differentiate between the actual or existing supply of nitrogen and the probability of the replenishment or regeneration of the supply. Though it is not possible to draw hard and fast lines between the available, unavailable, actual, and potential nitrogen of the soil, these subdivisions are in reality fundamentally distinct. Nitrogen is available as plant food chiefly in the form of nitrate of ammonia, though for practical purposes organic nitrogenous material, such as manure, tankage, dried blood, etc., that in almost any kind of soil decomposes and forms ammonia, should be included. In many soils only a small and insufficient fraction of the total nitrogen present is available. This is a direct result of improper biological conditions in the soil and is usually, if not always, due indirectly to improper chemical and physical conditions, such as imperviousness to air and water a tendency to become waterlogged or to bake, the lack of phosphates or of lime, etc. Successful farm practice presupposes the amelioration or prevention of such conditions, and as an obvious corollary demands that the soil be kept in such good tilth that the various groups of nitrifying bacteria may be actively engaged in changing the organic nitrogenous compounds into suitable food to be used by various crops. This assimilation of nitrogen by the growing crop and the washing away of the available plant food in the drainage water in regions of heavy rainfall are responsible for the annual removal of large quantities of nitrogen from cultivated fields. Under ordinary agricultural conditions, therefore, the potential nitrogen supply is of the greatest importance. In truck farming and, in fact, in many types of intensive cropping, the potential nitrogen supply may be largely artificial, depending upon the application of nitrogenous fertilizers. It then becomes a question of economics as well as a study of the maintenance of fertility to determine how much fertilizer to apply to secure the maximum net profit from a continuous series of crops.

In rotation systems which include clover, cowpeas, or other nitrogen-gathering crops either for hay or for green manure, the nitrogen supply, though naturally produced, is still largely under the control of the farmer and depends upon his ability to grow well-inoculated nitrogen-gathering crops at intervals which in the older agricultural regions have been empirically determined. The practical utilisation, however, of the nitrogen-gathering plants which have no recognised value as crop plants up to the present time has been largely accidental. In spite of the fact that virgin land as well as worn-out land that has been allowed to 'go wild' is generally rich in nitrogen, little, if any, attention has been given to the plants responsible for the nitrogen-fixation. Nor is this a point of merely academic interest. Though but little time can be given to land which is not producing money crops, it is not impossible that only slight and occasional attention directed to encouraging the apparently valueless nitrogen-gathering plants would materially aid in maintaining the fertility of unused fields, as well as in forcing the worn-out or waste areas to reclaim themselves partially.

The alder, New Jersey tea, silver berry, buffalo berry, and sweet fern among the nonlegumes and numerous native and ordinarily unnoticed legumes belonging to the genera Kuhnistra, Psoralea, Genista, Baptisia, Melilotus, Amorphae, etc., occur throughout wide areas in the United States and with little trouble could be extended over much of the unused land. This is one of the simple and inexpensive and none the less valuable posssibilities for the conservation and enhancement of the agricultural resources of the country. For in agriculture, even more than in other lines of science or business, it is necessary to plan constantly for future improvement and expansion.

CONCLUSION.

The plants which are of importance to us in the present epoch, are the legumes which can be included in cropping systems; the legumes and root-noduled nonlegumes which cannot be used in modern intensive agriculture, but upon which the potential fertility of land now unused may perhaps depend; and last, but not least, upon the types of microscopic plants of which Clostridium and Azotobacter are representatives. These bacteria are undoubtedly important both in supplying nitrogenous food in intensive systems of agriculture and in aiding the nitrogen-gathering legumes, and nonlegumes, to maintain or increase the fertility of virgin soils. The determining of the proper rôles of these various activities, the possibilities of the control and economic enhancement of the desirable functions, the recognition of the practical limits of biological factors in farm practice, as well as when and how to use nitrogenous fertilizers profitably—upon these things the economic maintenance of the Agricultural nitrogen supply will depend.

The Supply of Sulphur to Cultivated Crops.

The extent to which cultivated plants require nitrogen, phosphate and potash, in order that they may attain a proper development and give an adequate yield, has long been the subject of practical determinations by agriculturists, in the form of laboratory and field experiments. There has not been by any means the same amount of attention to the similar requirements in regard to sulphur as a plant food; for various circumstances to be stated later, have led to it to be considered that these are small and adequately supplied without the making of any specific attempts to provide sulphur in manures. Recent work on the part of investigators has, however, made it doubtful if this is a correct view of the case, and the purpose of the following article is to present a simple account of the subjects and results of this work.

The investigation was suggested by experiments which had for their object the determination of the amount of sulphur in the feeding material given to sheep for the production of wool. Sheep's wool consists largely of a proteid material rich in sulphur, and this made it appear that the crops on which the sheep were usually fed must contain and provide a larger amount of that element than is commonly understood. The subject was further advanced by the recognition of the fact that the determination of the amount of sulphur in plants, by an examination of the ash, gives results which are generally much too low, as that substance is lost to a greater or less extent during the course of the analysis; the work of several investigators has given support to this view of the case.

In the trials which were undertaken, methods were employed for the determination of the amount of sulphur present (as sulphur trioxide) which would entail as small a loss as possible of sulphur during the work of analysis. Some of the results obtained in this way are interesting. They show that a given quantity of rice grain contains one hundred times as much sulphur trioxide as that which would be indicated by analysis of the ash from that amount of grain; while in the case of cotton seed and the soy bean, the total sulphur trioxide recovered by the method employed is about ten times as great as that in the ash. The disparity is usually largest in plants like the cabbage and the onion, which contain a fair proportion of volatile sulphur oils.

The matter of practical importance brought forward by these considerations, is that cultivated crops probably remove much more sulphur from the soil than has been supposed. Thus, basing the computation on an ash

analysis, a crop of corn of one hundred bushels per acre would appear to remove about ½-lb. of sulphur trioxide; while the total actual amount consumed by the same crop, employing the method of determination used by the investigators, would be more than 20 lbs. These facts are sufficient to show that careful attention is required to the subject of the supply of sulphur from the soil to growing plants.

It is commonly realized that a certain amount of sulphur must be available for the use of plants, particularly in view of the fact that all the proteids which are found in plants contain sulphur. The reason why so little attention has been given to this element in divising schemes of manuring would appear to be that the amount of sulphur required by crops is usually considered to be small, so that little is removed from the soil and the ordinary supply is sufficient for the growth from season to season. There are added to this circumstance the difficulties that arise in estimating the total sulphur in soils; the most reliable methods that have given the best figures are tedious, but are much more accurate than that of ash analysis or extraction with acids, because they give results which take account of all the sulphur in the soil, in whatever form it may exist. It may be stated shortly that the effect of the more accurate determinations has been to show that the amount of sulphur in all ordinary soils is comparatively low.

There is not much significance to be attached to this proportionately low sulphur content of soils, if it continues to be maintained that the requirements of plants in this direction are also relatively small. The matter appears in another aspect, however, when it is considered, as a result of the work to which attention is being given, that the amount of sulphur removed by crops from the soil is, in proportion to the supply, quite as large as phosphates; while in the case of crops like the cabbage, onions and turnips, it is actually larger.

The work undertaken included the determination of the change in the sulphur content of soil that is caused when plants are being grown continually on them, and for the purpose a number of analysis of cropped virgin and manured soils were made, the soils of the different kinds being as nearly alike as possible in relation to such matters as drainage and topography. The unmanured soils employed in the investigation had received little or no manure for periods varying between fifty and sixty-three years. The manured soils had been chiefly given applications of stable manure.

It was shown, first of all, that about 40 per cent. of the sulphur trioxide had been lost by the growing of crops on the unmanured soils; in every case they gave a smaller percentage of sulphur trioxide than was found in the virgin soil. The matter of practical importance which may be deduced is, that the continuous raising of crops on land, without adequate manuring, causes a large decrease in its sulphur content. With the manured soils, it was demonstrated that their sulphur content was maintained, and even increased to some extent, by liberal applications of stable manure.

The amount of sulphur in the soil and the quantity supplied in manure cannot be considered alone, in such investigations. Rain-water is responsible for the addition of a certain amount of sulphur to the soil, more particularly in parts of the world where soft coal is burned. It is pointed out in the Bulletin which describes the work under review, that it has been found at Rothamsted that the annual rainfall adds about 18½ lb. of sulphur trioxide per acre. This quantity naturally varies, from season to season, and with the conditions of the country which may be under consideration. Correlated with this gain of sulphur, there is its loss in drainage water. At Rothamsted, Voelcker and Frankland have found that the quantity of sulphur trioxide lost annually from the unmanured and manured plots are

respectively 24·7 and 41·0 to 106·1 per million. In discussing such losses, Hall assumes that the mean annual drainage is equal to 10 inches of rainfall and, employing the above figures, each acre of the unmanured land would lose annually about 50 lbs. of sulphur trioxide, while the similar loss in the case of manured land would be from 85 to 220 lb. Thus the loss of sulphur trioxide by drainage is large, and in case of unmanured lands, it is nearly three times as great as the amount contributed in the rainfall. These figures are not, of course, universal in their application; they will be modified considerably, particularly by matters connected with climate.

These considerations would appear to indicate that it is necessary for the supply of sulphur in cultivated land to be maintained with the aid of manures. This has been done unconsciously for many years, more especially by the application of superphosphate of lime (which contains calcium sulphate), ammonium sulphate, potassium sulphate and pen manure, while gypsum has often been used, with the idea that it was more in the nature of stimulant than an actual provider of plant food. In this way the methods are indicated which must be employed if it is considered necessary to supplement the supply of sulphur in the soil. The question has not yet been completely answered, nor is it claimed that this is the case by the authors of the work under consideration, who state on the other hand what they: 'realize the desirability of extreme caution and conservatism in presenting the views outlined.' The importance of the subject from the practical point of view, the small amount of attention that it has received in the past, and the striking results that appear to be obtained when it does receive attention, all point to the necessity for further careful work which will supply definite knowledge as to the requirements of plants of sulphur, and the ability of the soil to supply them with this element.—*Agricultural News.*

CAMPHOR.

The shipments of camphor—a Government monopoly—from Formosa in 1910 were as follows:—

	lbs.
United States	2,942,800
Germany	1,808,000
France	908,667
United Kingdom	542,400
India	249,333
Total ...	6,451,200
Japan	35,072

It is stated that Japanese refiners have to pay 5 yen 80 sen (11*s.* 10½*d.*) per 100 kin (133 lbs.) more for crude camphor than those in Europe and America, and that there was a strong movement among the former to induce the Government to sell the article at the same price in the home and foreign markets. As Japan has recently commenced the manufacture of celluloid, the price of camphor, which is the chief ingredient, is of great importance. The Formosan Government has now ordered the price of camphor exported to Europe to be raised from £7. 5*s.* to £7. 10*s.* per case from the commencement of the present financial year (April 1, 1911). This price is for the improved "B" quality (mark "BB").

The output during 1910 was below the estimate, the quantity authorised *viz.*, 7,706,000 lbs., was not reached.

The distillation of camphor from the leaves has not yet emerged from the experimental stages.

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THE U. P. A. S. I.

(INCORPORATED.)

The Indian Tea Cess Committee.

Mr. J. Carson Parker has been appointed by the Government of India as representative of the Association on the above Committee, in succession to Mr. George Romilly.

The next meeting of the Committee is likely to be held at Calcutta, towards the end of January, 1912.

The International Rubber Exhibition, 1911.

In a letter, dated the 28th September 1911, Mr. H. B. Kirk, of the Periyar Rubber Co., Ltd., writes as follows :—

" Referring to the absence of any exhibit of Periyar Rubber from the recent Rubber Exhibition, which has already been commented on in your columns my Colombo Agents have now received the following letter from their London friends. *Periyar Rubber.* We note what you say. We cannot imagine what report it can be that states that this rubber was never received. It is quite a mistake. We duly entered it for the *India Rubber Journal* competition, and forwarded the box on the first day that exhibits were received, and Mr. Staines Manders, to whom we applied for an explanation, assures us that it was exhibited, and that samples are now, with the other entries for this competition, before the jurors, whose reports will be out at the end of next week. "

Closed accounts in regard to the South Indian Stall at the above Exhibition have not been received yet, but a statement of approximate expenditure to date which has been submitted by Messrs. Rowe, White & Co., Ltd., points to a gross outlay of about £550.

Mysore Exhibition, 1911.

The Scientific Officer returned from Mysore on the evening of 4th October, and the Secretary of the U. P. A. S. I. has taken his place at the Exhibition.

The U. P. A. S. I. exhibits have been arranged in a building by themselves and they form a most interesting and effective show which is eliciting a good deal of attention. A refreshment room, where South Indian tea and coffee is supplied, is being conducted by Messrs. Spencer and Co., in connection with the exhibit.

The Mysore Exhibition was formally opened by His Highness the Yuvaraja on Saturday afternoon, 30th September, and there was a large attendance of ladies and officials. A full account of the Exhibition will be published in the *Chronicle* as soon as the judges have awarded the prizes and medals.

PLANTERS' PAPERS.

V.—Hevea Rubber Wood as Fuel.

Mr. H. B. Kirk, the Managar of Periyar Rubber Estate, has sent the following note for publication :—

"EXPERIMENT OF BURNING CUT RUBBER TREES *versus* JUNGLE WOOD."

"The rubber trees were cut down one month ago, and with dry weather since the wood is fairly dry. The jungle wood is old dry wood. One yard of rubber firewood weighed out 863 lbs. against one yard of well dried jungle wood weight 721 lbs.

"The yard of jungle wood lasted 11 hours in my drier, *i.e*, for a whole day's work, while the yard of rubber fuel lasted 7 hours only, and we had to use rather over a third of a yard of this fuel extra to get through the whole day's work. The temperature of the drier was kept steady on both days. The rubber fuel makes far more flame, and in consequence burns far quicker with no special extra heating powers.

"The rubber fuel is far easier to cut, and this consideration would make the cost of the two fuels about equal, and there is no donbt that it will be advantageous to get rid of all trees which are lying about the ground after thinning out is done, and also it may help to solve difficulties over shortage of fuel for a time.

"During the eleven hours, approximately 1,200 lbs. of rubber could be dried, with a temperature never exceeding 110 degrees."

In his covering letter, Mr. Kirk says, "I am personally glad to have found that I can get rid of all the rubber trees cut out and lying about, and getting in the way of tappers, &c.

"It is much easier to cut than jungle wood and requires very little splitting when stoking. I imagine that it contains a large proportion of some sort of resin which makes such a flame.

Owing to the strikes during August, says the *Grocer*, public sales were much below the normal in point of quantity, with the result that prices of the lower grades temporarily had a firmer tendency. Since the labour troubles have been settled, however, the accumulated offerings of tea have been very heavy, amounting this week to over 93,000 packages of Indian, Ceylon and Java. Taking the present strong statistical position into account, there is no need unduly to press forward the supplies, but importers are evidently desirous of taking advantage of current rates. The resources of the trade have been severely taxed to deal with the excessive number of samples this week, amounting to about 3,000, it being physically impossible for buyers to deal adequately with such a number. The demand has been fairly active for all good to fine liquoring teas, but there is less inquiry for the lower grades, prices of which have given way decidedly. Fair common whole leaf is about $1\frac{1}{4}d.$ per lb. dearer than at this time last year. Shipments from Ceylon reveal a deficiency compared with last year, but during the latter half of August exports from Northern India exhibited a material increase above those in the same period of the previous year. It is apparent that with heavy shipments of Indian coming forward, buyers will only operate cautiously in the hope that prices may decline somewhat. Quantity rather than quality appears to be characterestic of the Indian crop so far.

DISTRICT PLANTERS' ASSOCIATIONS.

South Mysore Planters' Association.

There being no quorum, an informal meeting was held at Saklaspur on 25th September.

PRESENT.—Messrs. E. M. Playfair (President), J. G. H. Crawford, W. L, Crawford, T. Anderson, S. Sladden, G. Anderson, C. I. E., C. Lake, and F. M. Hamilton, Hon. Secretary, visitors, Mr. Redmond and Mr. Seshaiya.

The Delegates to U. P. A. S. I. gave an account of proceedings at the meeting in Bangalore.

Scientific Officer's Assistant.—The members present thought that the assistant should have diplomas, but that it was not absolutely essential.

With reference to a bungalow for the assistant to live in, it was suggested that planters in Mysore should be asked to send in the names of unused bungalows that were available, and also that they should be asked to state whether there was any land planted with coffee on which the Assistant could work.

Further, the members present were of opinion that a small rent should be charged for the use of a bungalow; this to be paid by the U.P.A.S.I., not by the Assistant.

Sanction was given to the allotment of Rs.1,500 towards the scheme.

Subscriptions.—The Honorary Secretary asked all members to pay up quickly, as it would be necessary to call for subscriptions for next year on the actual due date, 1st April.

The Honorary Secretary also raised the question of subscription payable by proprietors resident in England, and it was considered that they might remain members of the Association when they paid for the Estates they owned.

Hybridisation Farm on Nilgiris.—Sanction was given to the allotment of a sum up to Rs.75 a year.

Continued Subscription to U. P. A. S. I. on a two-anna basis.—It was not considered politic to reduce the Association subscription which is now Re. 0-2-4 per acre.

Planters' Benevolent Fund.—The meeting was informed that in future receipts would be granted to all subscribers by the U. P. A., through the Local Honorary Secretaries and that the financial year would be the same as U. P. A., namely, 1st July to 30th June.

Crimping.—It was suggested that the Honorary Secretary should communicate with North Mysore and Bababudin Associations with a view to drawing up rules on the lines of the Travancore Labour rules.

Section Meetings as proposed at U. P. A. S. I. meeting.—The Mysore Associations will have to hold meetings of Delegates for the three Associations after the appointment of an Assistant Scientific Officer, and any representatives from Coorg would of course always be welcome at these, but in general affairs of U. P. A., the meeting does not consider the scheme practicable.

(Sd.) FRANCIS M. HAMILTON,
Honorary Secretary.

Mudigere, 1st October, 1911.

THE INDIAN TEA ASSOCIATION, (LONDON).

At the last Annual Meeting of the members of the Indian Tea Association, Sir James Buckingham, C. I. E., (Secretary), submitted

THE ANNUAL REPORT,

which stated *(inter alia)* :—

The total quantity of tea exported from Northern India, *via* Calcutta and Chittagong, between April 1, 1910, and March 31, 1911, amounted to 238,382,478 lbs. as compared with 235,236,513 lbs. for the previous year, thus showing an increase of 3,145,965 lbs. During the same period the quantity exported from Southern India was 18,617,708 lbs. against 16,616,154 lbs. in 1909-10, and 15,243,077 lbs. in 1908-09. The total exports from Northern and Southern India by sea were—1910-11, 257,000,186 lbs.; 1909-10, 251,852,667 lbs.; 1908-09, 235,857,410 lbs. In addition to the above, 165,972 lbs. went by rail to Bombay during 1910-11, 154,323 lbs. in 1909-10, and 756,834 lbs. in 1908-09.

The Committee is indebted to Mr. Reade, the Principal of H. M. Customs, for the following statement of the quantities of Tea imported into the United Kingdom from China, British East Indies, Ceylon and other countries during the year 1910 :—

Weight by	China, including Hongkong and Macao.	British Indies.	Ceylon.	Other countries.	Total.
Importers ...	18,892,557	180,283,607	108,205,471	25,348,946	332,730,581
Customs ... (after weighing.)	18,914,720	180,265,145	107,634,468	25,032,757	331,847,090

With regard to Indian Tea, it is the first time for many years that importers and customs figures have so nearly agreed. On March 31st last terminated the five years during which the various Governments and Associations had promised their support to the Scientific Department, and the Committee is pleased to learn that this support has not only been extended to another five years, but that the subscriptions have in most cases been materially increased, in order to meet the extra expenditure that will be incurred in carrying out Dr. Hope's scheme for the enlargement of the Department. . . . The question of bidding in one-eighth of a penny at tea auctions was again raised by the Tea Buyers' Association, who forwarded a copy of a resolution passed by their Association in favour of bidding in one-eighth of a penny at public auctions, and asked the Committee to appoint a sub-Committee to meet several members of the Committee, and discuss the question. Several conferences were held without arriving at any settlement. The Committee regrets that the Tea Cess Committee did not see its way to make a larger allotment towards the United Kingdom advertising campaign and the Indian Tea exhibit at the Festival of Empire Exhibition, but correspondence is still passing between the two Committees, and it is hoped that eventually a sum of at least another £2,000 will be allotted. . . .

The Chairman in moving the adoption of the report, first referred to the loss the trade had sustained from the death of Sir Charles Elliott, who at one time occupied the position of Chief Commissioner of Assam, and also from the death of Mr. Sinclair MacLeay, who was Chairman of the association for two years. He felt sure that the general meeting would confirm the resolution of sympathy which the Committee had passed with the relatives of Mr. MacLeay. (Hear, hear). The membership roll of the association was now 151, against 146 last year. The past year, on the whole, had been an uneventful one. It was proposed to extend the scientific department, and new buildings were being erected on a site of the Jorehaut Co., and he thought they ought to tender their thanks to the directors of that company for meeting them in the matter. Mention was made in the report of the request made by the buyers to be allowed to bid in one-eighth of a penny at public auctions, and since the report was printed they had had another letter from the buyers enclosing a list of the buying firms who were in favour of the change. The committee had naturally given this the most serious consideration, as it was most important that the relations between seller and buyer should be kept as smooth as possible, and all friction removed; but they had come to the conclusion that, looking to the fact that a certain section of the buying trade itself did not want the change, it would be unwise to do it. With a view, however, to accommodating both sides of the buying trade, they had agreed to recommend sellers that where there was a divided lot they should recognise a bid thereof, say *8d.*, and draft as a bid of $7\frac{7}{8}$*d.*, for both lots, and that the bidder could not be cut out of his second lot, and if anyone wished to cut him out he must bid *8d.* for the whole lot. Whether that would serve the purpose remained to be seen, but they thought the buying trade generally would welcome this as an attempt to meet the views of both sections of their own trade. Proceeding to deal with the Tea Cess fund, the Chairman expressed regret that a larger sum was not allowed for the tea exhibit at the Festival of Empire Exhibition at the Crystal Palace. The committee considered that it was as necessary to protect their interest in the United Kingdom as in any other part of the globe, and the argument that the cess fund was inaugurated to push Indian tea on the Continent did not appear to them to be a cogent one.—Mr. F. A. Roberts, in seconding the resolution, said he felt somewhat strongly on the question of the application of the cess fund to the United Kingdom, because the conditions of the industry had changed very much since the fund was inaugurated. At that time they were struggling with a large over-production of tea, and they were obliged to find fresh outlets for it. Now conditions were changed, and although they did not wish to be over-sanguine, yet it looked as if they would not have any more tea than was required for this country. Such being the case, it seemed to him rather useless spending large sums of money in endeavouring to push tea on the continent if they were not likely to have the tea to give to them, and there was the danger in this country, with the high price that was likely to rule for common teas, of blenders using China teas and teas of other countries for their blends. Therefore, it seemed to him absolutely necessary, to keep Indian teas before the eye of the public as much as they possibly could.—Mr. J. N. Stuart also thought that it was important to push Indian tea in this country. With regard to the $\frac{1}{8}$th bids, he would point out that the Tea Buyers' Association, which comprised the biggest dealers and blenders in the country, were quarrelling about a bid of $\frac{1}{8}$*d.*, whereas if they put up the price of tea by *1d.* all round, they could be thoroughly happy and make good profits without worrying themselves. —The report was adopted.

RUBBER.

In Angola, 1910.

According to a consular report, the principal rubber-yielding tree in cultivation in Angola is the *Manihot glaziovii* (Ceará rubber.) Some 2,000 acres are at present planted in the district of Loanda alone. Tapping of the trees is in full swing during the wet seasons and is reported satisfactory. Up to now Europeans only have paid attention to this industry; but the natives, seeing the good results, are beginning to take an interest in this cultivation. The native owners of coffee land in Golungo Alto are enthusiastically planting *Ceará Manicoba* on their properties. It is impossible to obtain an accurate account of the total amount produced on the various plantations, since the rubber gained from the indigenous plants is not differentiated from plantation rubber in the custom-house; it is calculated, however, that the export of Manicoba rubber during 1910 reached at least 5 tons.

Of the Angola rubber plantations next in importance to the *Manicobas* comes the *Ficus elastica*. The oldest plantations have plants of 15 years' growth and good rubber is annually extracted from these trees. The chief point in favour of this species is that the trees will endure rough treatment at the hands of the native labourers without suffering any serious consequences. The *Manicoba*, on the other hand, is much more delicate. Rough instruments for making the incision kill the tree sooner or later. The *Manicoba* in this country is a short-lived tree and will not endure rough tapping operations.

Of other rubber trees introduced during recent years no extensive plantations have been made. For the small planter the Pará rubber seed imported from Ceylon proved too expensive, as the percentage of trees which grew was very small indeed. Those trees planted, however, at elevations varying from 1,000 to 3,000 feet grow well. Tapping of the Pará rubber trees has not yet commenced, but it is doubtful whether this species will compare favourably with the *Manicoba* and *Ficus elastica*. Further experiments with *Castilloa* and *Funtumia* are in progress on the Government's experimental farms, but on private estates no attention at all is paid to these rubber-producing trees.

In the district of Benguella, the central region from which root rubber is exported, no rubber plants at all are cultivated to-day. Experiments have shown that South American rubber trees as well as the Assam tree *Ficus elastica* do not thrive, the climate being too cold. The experimental plots in the same region of various species of *Manicobas* are necessarily small, but the stunted growth and slow development of the plants indicate that the region of Benguella is not sufficiently tropical for growing rubber.

Tapping Experiments with Ceara in Uganda.

The results of two months' (February and March) tapping of twelve Ceará (*Manihot Glaziovii*) trees belonging to the Mabira Forest (Uganda) Co., Ltd., are contained in a Supplement to the Uganda *Official Gazette* for May 15th, 1911. The details show that, whereas the trees tapped on the pricking system gave a decrease of 59·51 per cent. in the second month, those which were tapped on the paring system, with no pricking yielded an increase of 24·23 per cent.

CAMPHOR.

Cultivation in the United States.

In the course of an article in the Year Book of the Department of Agriculture U. S. A., Mr. S. C. Hood, Scientific Assistant, and Mr. E. R. True, Physiologist in charge, Office of Drug-Plant, Poisonous-Plant, Physiological and Fermentation Investigations, Bureau of Plant Industry observe :—

INTRODUCTION.

The camphor tree seems to be native in the coastal regions of south-eastern Asia, both on the mainland and in the southern part of the Empire of Japan. It is but natural, therefore, that the earliest records of the plant should occur in Chinese literature. In the sixth century A. D. the tree was referred to as a valuable timber, no reference being made, however to the gum. It is somewhat strange that a search of the older Chinese literature should have failed to develop any earlier references to either the tree or its rather striking product.

The name has been traced to various possible sources, among others to the Sanskrit 'karpura,' meaning white. The early literature of India, as well as the Greek and Roman classics, contain no references to camphor. It seems to have been well-known to the Arabians, the gum having been first mentioned early in the sixth century A. D. It appears under the name of 'caphura' in a medical prescription written at about this time by Actios, in Meso potamia. During the ascendancy of the Arabians in the Mediteranean region, camphor seems to have become a well-known product enumerated among articles possessed by princes and other persons of great wealth. The refining of camphor seems to have originated with the Venetians, and was long therefore carried on in Holland as a secret process. In time, however, information on the subject seems to have become more widely diffused, and with the return of travellers camphor trees were brought to the Occident. Camphor has long enjoyed a prominent place in medicine, but it was not until its usefulness in the making of various technical products was demonstrated that commerce in camphor reached great importance.

Within the last fifty years there has been a greatly increased demand for this product in the manufacture of celluloid and other notrocellulose products. It enters into the manufacture of many pharmaceutical preparations, and from it are made various antiseptic compounds. It is also used as an insecticide. There are probably few plant products which find so many and such varied uses as camphor.

The greater part of the World's supply of camphor comes from Formosa, but there is a relatively small production in Japan. The Japanese camphor monopoly controls the entire output of Japan and Formosa and is said also to handle a considerable portion of that produced in China. The output of the monopoly for the year ended March 10, 1910, was about 8,000,000 pounds of camphor and camphor oil.

Within recent years there has been a revival of the industry in the Chinese province of Fukien, and during the year 1909 there were shipped from that province to Foochow about 1,064,000 pounds of camphor, and 2,660,000 pounds of the oil. In both China and Formosa, camphor is made from the native forest trees and until recently there has been no serious movement toward replanting. The camphor forests are thus becoming exhausted, and if the cultivation of this tree is not begun, we must inevitably face a shortage of camphor with consequent high prices.

PRESENT METHODS OF MANUFACTURE.

Until recent years no attempt has been made in either China or Formosa to improve the methods of camphor manufacture. The usual apparatus consists of a shallow iron kettle supported over a stove made of stones and clay, the kettle being fitted with a perforated wooden cover, over which is placed a bottomless wooden tub with a removable cover. A bamboo tube leads from the tub to a series of wooden boxes, over which water is run for cooling purposes. These boxes which serve as the condenser, are sometimes filled with bundles of rice straw to facilitate cooling.

The apparatus is set up, if possible, by the side of a small stream near the trees to be worked up. The trees are felled, the trunks, roots, and large branches cut into small chips, and the tub filled with this material. Steam is generated in the kettle and passes through the cover into the tub filled with the chips. The camphor is taken up by the steam which passss through the bamboo tube and is cooled and condensed in the boxes, where it is deposited in a solid mass. From time to time, various minor changes have been made in the apparatus. At present, in some parts of Formosa an inverted sirup evaporator is used as a condenser in place of the boxes.

This apparatus seems crude, but it has the advantage of being portable and can be carried farther and farther into the forest as the trees become exhausted. Furthermore, the work is carried on in those forests where the workers are exposed to the raids of the 'head hunters' and many still are destroyed annually by these tribes. In Japan, some progress has been made in devising improved apparatus, but the new condensers have not yet come into general use.

CULTIVATION OF CAMPHOR IN THE UNITED STATES AS AN ORNAMENTAL.

When the camphor tree was first introduced into this country is not clear. There are several trees in Florida which were brought in as seedlings between 1870 and 1875, and from their seed have been grown many of the camphor trees of that State. About 1880, the Department of Agriculture distributed seed and young trees, and these also have yielded stock for nursery purposes.

During the past ten years camphor trees have been very extensively planted for ornamentals and windbreaks in the Southern and Southwestern States and in some places nearly every home has one or more camphor trees in its yard. One Florida nursery alone sells annually about 15,000 trees.

Although the introduction of the camphor tree was undertaken in the earlier days chiefly because of the value of this plant as a shade tree, the idea of its eventually proving useful for the production of camphor was not altogether overlooked. Mr. William Saunders, in the report of the Department of Agriculture for 1889, says they answer a good purpose as ornamental shade trees, with a probability that when they become more plentiful and better known efforts may be made to extract camphor from the branches. Such efforts seem, however, to have been rather long delayed. In the summer of 1904, as a part of the work of the then newly established laboratory of drug-plant investigations, Mr. W. O. Richtmann was sent into the field to investigate the camphor content of the trees previously introduced. Camphor material was distilled in Florida, Texas, California, and others of the warmer States. Encouraged by the favourable results obtained, the Department made arrangements to secure the use of land at Huntington, Fla., to be chiefly devoted to camphor work. This work took on unusual interest shortly after it was undertaken on account of the

high price to which Japanese camphor rose, supposedly because of the speculative operations in Japan and elsewhere.

These preliminary experiments seemed to show that camphor, gum and oil are produced under American conditions in quantities sufficient to justify further work. Shortly after the preliminary plantings had been made at Huntington, the experiment was removed to Orange City, Fla., in order to obtain somewhat better facilities. The results summarised in this paper are almost wholly worked out after the removal to the latter point.

METHODS OF CULTIVATION.

The camphor tree is hardy where the winter temperature does not fall below 15 degrees F., but even at this temperature,some loss of small branches will occur if the tree continues to grow until late in the season and has become completely dormant before the frost comes. The tree easily adopts itself to new conditions, and can be grown on a wide range of soils ; in fact, it can be grown on any soils except on very low land where water stands part of the year. The maximum growth occurs, however, on a rich, well-drained soil.

For commercial cultivation it is probably best to plant on low priced sandy land, since in this situation the trees do well with less cost for cultivation and a smaller initial cost of land.

PROPAGATION,

Camphor can be propagated by seed, cuttings, and root cuttings, but for commercial purposes the first method is to be preferred, except in cases of special varieties having some valuable characterestic which would not be reproduced by the seed. In propagation by seed great care should be taken in the selection of the land for the seed bed. If possible, a rich, well-drained soil which has been under cultivation in previous years should be found. If this is not possible, new land can be used ; but in either case land infested with Bermuda grass or maiden cane cannot be used, since the roots of these grasses will take up the moisture in the soil and prevent the germination of the seed.

THE SEED AND SEED BED.

The land should be ploughed about September 1st and well cut up with the disk harrow. About October 15th it should again be worked and all dry roots and trash removed. Too much emphasis cannot be placed on the preparation of the seed bed, since after the seeds are planted no cultivation can be given for three months.

In size and shape, camphor seed resembles the common wild black cherry, consisting of a small stone surrounded by a fleshy pulp covered with a thin black skin. When the seeds are ripe, about October 15th, they are of a dull-black colour and are then ready to be gathered.

The seed bed should be prepared before the seeds are gathered, and as soon as secured, the berries should be planted fresh with the pulp left on. For convenience in future handling, the seed should be planted in hills $3\frac{1}{2}$ feet by $1\frac{1}{2}$ feet, with three seeds in the hill, and covered about 2 inches deep. This method will require about 24 quarts of seed per acre and will produce enough trees for setting 16 acres of field planting.

CULTIVATION.

The seeds will begin to come up about three months after planting but four or five months are often required for a full stand. The percentage of germination is very low and only about one-half of the seeds may be expected to grow. Cultivation should begin as soon as possible, and as soon as a full stand is obtained the plants should be thinned to one in a hill and given a good dressing of high grade fertilizer.

The first season the plant should make a growth of 12 to 18 inches with a very large and vigorous root system. The treatment the second year should be the same, and at 26 months from planting the plants should be from 2 to 3 feet high and well branched. At this time they are ready for field setting.

GROWTH.

The root system of a 2-year-old camphor tree consists of a taproot 1 inch in diameter at the top and about 3 to 5 feet long. Up to this time the laterals are represented mainly by small fibres on the taproot. In transplanting under commercial conditions these fibres are killed and are not renewed as quickly as in some other trees. The tree must be set early in the fall in order that the root system may be well established before the hot weather of the spring comes on. Experiments have shown that setting in December gives the best results.

PREPARATION OF LAND FOR PLANTING.

The land should be well prepared by deep ploughing early in the fall and again worked just before the trees are set. It is desirable to lay off the rows in checks 6 by 15 feet, since this will facilitate later cultivation. The trees can be dug with a tree digger and should be cut back very severely. All leaves and small twigs should be removed and the tree well headed back. The taproot should be cut back to 12 inches and all the small laterals removed.

The trees should be set at the same depth they were in the seed bed, and a small basin formed by the soil about them for the reception of water. One application of water should be given when the trees are set and one or two later on, as needed, if the rainfall is scanty. No growth will take place in the roots if dry soil is allowed to remain in contact with them, but too much water will cause the roots to sour and die. In those parts of the South, where there is a definite rainy season, good results can be secured by setting the trees about July 1st, no watering being needed except a small application at the time the trees are set. By this method the trees have a tendency to continue growth until late in the fall or early winter, and are exposed to danger of frost, since they are very tender when in growing condition. In frost-free localities, however, this method can be followed with less expense.

FERTILIZING AND CULTIVATING.

The question of fertilizer for the trees after they are in the field has not yet been worked out. Experiments have shown that the trees respond very readily to fertilizer, but whether the additional growth will pay for the material used has yet to be determined. It is fairly certain, however, that it will pay to apply about 2 lbs. per tree for the first two years, until they get well started.

Cultivation should be thorough and frequent, and where it can be done, small crops, such as cotton, peas, and corn, should be grown between the rows for two or three years. If, however, a tall growing crop, such as corn, is used, care should be taken not to plant too near the trees, since even slight shade retards growth.

At five or six years from the seed the trees should be 7 to 8 feet high and very bushy. At this time the trees should be trimmed to shape them up into hedges and the first harvest should be secured.

HARVESTING.

Up to the present time all camphor is made from the wood of old forest trees and but little use has been made of the leaves and branches. This is partly due to the fact that in camphor countries the camphor is localized mostly in the old wood, while that in the leaves contains a large

percentage of oil. In the Southern States the camphor yield of the leaves is high and there is little in the wood before it reaches an age of 10 years or more. To grow the tree for the wood means long waiting for returns and the ultimate destruction of the tree.

Experiments have shown that the tree can be handled in hedges and kept trimmed back to a height convenient for working. In fact, camphor is often used as a hedge tree in the South and responds to trimming more readily than almost any other tree or shrub. This adaptability for hedges can be taken advantage of for commercial purposes, repeated experiments having shown that the camphor yield can be greately increased in the leaves by trimming.

On the Departments experimental plats the trees are planted in rows 15 feet apart and 6 feet apart in the row. They are grown to an A—shaped hedge 8 feet high or 8 feet wide at the base. By this method they are kept back to a convenient size for working and are not dwarfed sufficiently to injure the vigor of the tree. At six years from the seed the trees will form a solid hedge in each row and will be thick and bushy to the ground.

Camphor is represented in the growing tissue by oil, which as the leaves mature is changed into camphor. Distillations made at different times during the growing season show a rapid gain in camphor content as the leaves approach maturity ; also that it is highest during the dormant period.

In most places in the South the tree has two growing seasons and two dormant periods. Growth begins in February and before May 1st a leafy growth of 6 to 10 inches has formed. On this growth are formed the flowers and seed. From May to June 15th the weather is hot and dry and the tree goes to a dormant period. With the coming of summer rains growth begins again and continues until about the middle of September, when the winter dormant period begins.

CAMPHOR CONTENT OF LEAVES AND TWIGS.

After the spring growth begins, there occurs a fall of the leaves 12 and 18 months old. Under normal conditions all leaves remain on the tree one full year. Distillations made from leaves of different ages showed a slight decrease in camphor content after maturity is reached, but a large proportion of the camphor remains in the leaf until it falls. Distillation from dead leaves fallen from the tree gave a yield of 2 per cent. of oil and camphor. The loss of camphor in the leaf as it matures and dies is greater, however, than the percentages show, since there is also a loss of water and a consequent decrease in the weight of the material.

With the twigs the difference is still greater. At the close of the growing season the twigs were found to contain as high a percentage of camphor as the leaves on them, but the yield from older twigs was very low. This is due to the fact that in the twigs the camphor is in the bark and almost none is localized in the new wood.

These experiments show that if the hedges are trimmed at the end of each growing season a maximum quantity of camphor is obtained with a minimum of useless material to handle. The hedges can be trimmed by machinery, so that the cost of harvesting will be small, and with some minor changes some types of machines now in use can be utilized. The Department of Agriculture is working on this problem, but as yet the tests are incomplete. After cutting, the trimmings should be taken to the distilling plant at once, since if they are allowed to dry in the sun or remain exposed to the dew and rain, there is some loss of camphor.

Distillation Methods.

Camphor is obtained in the same manner as other volatile products; that is, by steam distillation. When steam is passed through a suitable receptacle filled with the leaves the camphor is extracted in the form of a vapour and passes off with the steam. If the camphor—containing steam is conducted into a condenser, the steam is condensed to water and the camphor is deposited as a solid or semisolid mass floating on the water or deposited on the inside of the apparatus. The volatile oil remains as a pale liquid floating on the water.

When brought from the field, the trimmings should be elevated to the top of the building, where they can be stored in bins until wanted for the retort. They should not be allowed to remain more than a day or two, however, since if piled in large heaps sweating will occur and some of the camphor will be lost. As needed, this material can be delivered to the retort through chutes with a minimum of time and labour.

Any of the standard types of retort employed for other volatile oils can be used for camphor. The most common one is a circular wooden vat about 6 feet in diameter and 8 to ten feet deep. This is fitted with a removable cover, which can be made steam tight. The retort is fitted with a perforated false bottom, and to its edges are attached four chains reaching to the top of the retort. Steam is admitted to the bottom through a pipe from the boiler. The retort is closely packed with the trimmings, the cover fastened down, and the connections with the condenser made. Steam should be admitted under pressure, but no pressure should be developed in the retort. To prevent this, the outlet pipe should be twice the size of the inlet pipe. The time required for distillation depends on the size of the charge, the closeness of the packing, and the amount of steam used. When exhausted the charge can be hauled out by means of tackle attached to the chains and the material carried on a track to the dump heap.

This type of retort gives good results with camphor trimmings, except that some difficulty is experienced when the charge is drawn out. This material, consisting of leaves and short twigs, does not hang together well and the charge is likely to fall to pieces before it can be gotten to its destination. If rods are used in place of chains, and to them is fastened a fine-meshed wire netting fitting closely to the sides of the retort, this difficulty is done away with. With this device, however, the material cannot be packed closely to the sides of the retort and uneven steaming is the result.

When metal retorts are used they are attacked by the camphor vapors and a deposit of oxids and sulphids of the metal is carried over with the camphor. This causes a black impurity in the camphor which injures its appearance, but as all crude camphor must be refined before using this impurity is later removed. It is almost impossible to avoid some of this impurity, since metal must enter into the construction of some parts of the apparatus.

Metal Retorts.

If a metal retort is to be used, it should be made of boiler iron three-sixteenths of an inch thick and cylindrical in shape. A capacity of 200 cubic feet will contain a ton of trimmings if closely packed. The cover of the retort should be slightly conical in shape with the outlet pipe in the centre. It should be riveted to a flange fitting a similar flange on the body of the retort, so that the joint can be made steam-tight by means of a packing ring. The fastenings should be swinging eyebolts attached under the lower flange and let into both flanges by slots. The bottom of the retort should be of the same construction as the top, but should be nearly flat and hung

to the retort by a heavy hinge on one side. The fastenings should be of the same sort as those used in the cover. The swinging bottom should be fitted with a false bottom of heavy wire netting of about 1-inch mesh, and supported on pillars raising it 4 inches from the inside of the bottom. The steam inlet should be by two pipes on opposite sides entering the chamber formed between the true and false bottoms. In this manner an even distribution of steam is secured over the bottom of the charge. The retort should be raised several feet from the ground, so that when the charge is exhausted, the bottom can be swung back and the charge allowed to fall out into a car, which can convey it on a track to the dump heap.

This type of retort is much more expensive than the wooden one, yet the greater durability and convenience will more than compensate for the extra cost. A type similiar to this is used for the distillation of pine chips, but this type is constricted at the top and bottom and the swinging bottom is of much smaller diameter than the body This cannot be used for camphor, since the charge will strike the shoulder at the bottom and have to be removed by hand.

The time required for distillation depends on the size of the charge and the amount of steam used. A ton charge can be completely exhausted in from two to three hours with a moderate amount of steam.

The problem of the condenser.

The problem of securing a condenser for camphor has been a difficult one. It is out of the question to use wooden boxes or inverted sirup evaporators, as in China and Formosa, and none of the types of condensers used for oil can be used, since the condensed product is a solid and deposits on the inside, completely filling it. Tubular and coil condensers are also out of the question. Several condensers of an entirely new type have been devised and comparative tests are being made with them. One has been secured which so far has given excellent results, but the tests are not yet completed. In the near future the Department of Agriculture hopes to have this problem worked out and to be able to recommend a condenser which will meet all the requirements of commercial work.

Refining.

As received from the condenser, the camphor is in a very impure state. It is a semi solid mass of a brownish colour and about the consistency of melting snow. This crude camphor contains about 70 to 80 per cent of pure gum camphor and about 15 to 20 per cent of camphor oil, the remainder consisting of oxids and sulphids of iron, water, and other foreign matter. This crude product must be refined before it can be placed on the market.

The first step in this process is to remove the oil. This is done by throwing the mass into a centrifuge giving a centrifugal force of 550 to 600 gravities. By means of this machine nearly all the oil can be removed, and washing with warm water while still in the centrifuge will remove almost the last trace. The camphor thus secured is dry, but still has a brownish colour, due to the metalic impurities. By the regular process of sublimation in iron kettles, the camphor can be secured in either the transparent slabs or "flowers of camphor," as is desired.

The oil secured from the centrifuge is of a brownish colour, and is one of the most complex of volatile oils. It contains several constituents which find ready sale in the trade, but chief among them is the camphor, which is dissolved in it to the extent of about 30 to 35 per cent. By fractional distillation and subsequent freezing of the camphor-containing fractions, this camphor can be secured and added to that first obtained.

The camphor oil secured from the wood in China and Japan contains a high percentage of safrol, and the fraction containing this is used in the trade in artificial oil of sassafras. Oil secured from the wood of Florida-grown trees contains good percentages of safrol, but little or none is found in the oil from the leaves.

YIELD.

Distillations made from more than 1,000 trees in Florida, Texas, Alabama, Louisiana, and California show that there is a very wide range in the camphor yield of the leaves and twigs. Some samples from trees which had been shaded by buildings or by other trees have given as low as 0·70 per cent. of camphor and oil together. Other trees which have been retarded in growth by being planted on very poor land and given no care have given as high as 2·77 per cent of camphor distillate. These, however, are extremes, the usual yield being from 1·75 to 2·25 per cent. All these percentages are based on the green weight of the material and are given in the percentage of crude camphor distillate secured. The amount of pure gum camphor in the crude product shows but slight variations and usually falls between 75 to 80 per cent. The usual yield of pure gum camphor from leaves and twigs of single trees is from 1·25 to 1·50 per cent, calculated on the green weight of the material. It has been shown, however that the yield is increased by trimming, and a larger yield can be secured from hedges.

As yet the hedges planted by the Department of Agriculture have not reached sufficient size for trimming, and it has not been possible to secure a satisfactory estimate of the yield per acre to be obtained. A number of tests have been made on ornamental hedges of various sizes and ages, but the material has been too limited to furnish definite data on the yield of hedges planted on a large scale. It is thought safe in estimating, however, that hedges planted 15 feet apart with the plants six feet apart in the row, grow 8 feet high will give 8,000 lbs. per acre, of trimmings for each of two cuttings, making a total of 8 tons per acre each year. This will give from 175 to 200 pounds per acre of marketable camphor. The trimmings of measured areas on ornamental hedges have far exceeded this, but it is well to avoid using the yield of a few square yards in estimating the yield per acre.

FUTURE OUTLOOK.

In many parts of the South, especially in Florida, there are large areas of light sandy land not well suited to general farming. This land can be secured at a low price and there is every indication that camphor growing on this land can be made a commercial success. The demand for the product is steady and if it could be supplied from a source less liable to price fluctuations than at present, it is probable that larger quantities of it would be used in the arts.

At the present time it is not advisable to plant camphor in small areas with the hope of securing a profitable income by selling the trimmings to a near-by distilling plant. It is a question as to how far it will pay to transport this material, and a planter might be left with a worthless overgrown plantation on his lands if a distilling plant should not be in operation in his vicinity by the time his trees were ready for trimming. Until the industry becomes well established, planting should be on a sufficiently large scale to warrant the building of a distilling and refining plant in connection with it, and for this purpose 200 acres may be considered a minimum area. The cost of production per pound will be less if made on a much larger scale. It appears probable that an area of 500 acres will warrant the installing of sufficient machinery to produce camphor at a minimum cost."

SELECTED CUTTINGS.

Fungus Notes.

THE BRACKET FUNGI.

This group of fungi belongs to the big division known as the Basidiomycetes, characterized by the production of two or four spores on the specialized hypha known as a basidium; the group is called the Polyporaceae. The family belongs to the Order of the Hymenomycetes, in which a definite fructification is produced having a special reproductive portion, or hymenium, made up of basidia closely crowded together. In the family in question the hymenium lines the cavity of numerous circular or polygonal tubes, or shallow depressions in the substance of sporophores varying much in colour, size, shape, and consistency, but all characterized by the occurence of the tubes lined with the hymenium. The Polyporaceae are closely connected with the Agaricaceae, or toad-stool family, in which the hymenium is produced on special gills running radially across the under surface of the sporophore. In the Polyporaceae, the sporophore, or fructification, may be umbrella-shaped like a toad-stool and have a central stalk; or it may possess a stalk attached to one side of the cap; or again the whole sporophore may be stalkless and project at right angles from the substratum like a bracket; or finally it may lie flat on the substratum with the hymenium turned upwards. In the first three cases, the hymenium is always borne on the under surface of the sporophore. As has been stated already, these sporophores may vary also in consistency; they may be fleshy, coriaceous, or woody, while many of them live for many years and periodically produce a new layer of tubes over the surface of older layers. The tubes themselves vary largely in width and depth, and the spores they contain may differ in colour. It is by means of these and similar differences that the genera and species are separated from one another.

The family is an important one for two reasons. In the first place, the majority of the species live as saprophytes on wood, and in consequence, are often responsible for a dry rot of timber. In the second, some of them, notably members of the genera Polyporus and Fomes are wound parasites on many different kinds of trees. In the genus Polyporus, the fructification may have a central or lateral stalk, or may occur as a bracket; it is however, always more or less fleshy when fresh, though it becomes hard when dry. In the genus Fomes, it may have a lateral stalk, or may be in the form of a bracket or hoof, but it is always of a woody consistency from the first.

In order to illustrate what has been said, one or two species may be considered in somewhat greater detail. One very common bracket fungus, both in temperate and tropical countries, is *Fomes lucidus* (Leys), Fr. The sporophores possess a lateral stalk, which may be as much as four inches long, or may be reduced to a broad basal tubercle, so that the fructification appears as a bracket. When the stalk is present it is usually more or less erect, irregularly cylindrical in shape, polished and varying in colour from bright chestnut to almost black. The apex of the stalk is at first white and conical, but later it grows into a broad cap or pileus, whose upper surface is yellowish-red, reddish—chestnut, deep red or almost black; it is polished like the stalk, and usually marked with concentric furrows. When the sporophore is immature the margin is swollen,

white and fibrous, and is not polished : while the varnished portion immediately behind it is then yellow, and the colour slowly deepens into that of the main part of the cap. The lower surface is white, and contains the tubes bearing the brown spores, which are ejected as a dust of the same colour. The substance of the sporophore is brown and fibrous. Several may fuse together during growth, and their outline then becomes irregular. Single caps are usually circular, or kidney-shaped, when stalked, and semi—circular when the stalk is reduced ; they vary in size from a diameter of 2 or 3 inches and a thickness of ½ inch to a diameter of 20 or more inches and a thickness of 4 inches.

The fungus occurs on several trees in temperate countries, and has been regarded as a wound parasite on oaks. In Ceylon it causes root disease of the cocoanut palm and grows on other palms, while it is associated, as well with bamboos. It is also known to be parasitic on the roots of the mango and on those of the flamboyante (*Poinciana regia*), while it is saprophytic on dead stumps of many other trees. (See Petch. *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. IV, No. 24.) In India, it has been considered as probably parasitic in several instances on forest trees, while it is recorded by Butler as the probable cause of a root disease of the areca palm (*Areca Catechu*). In the West Indies it has been recorded on dead wood, from Trinidad, while Stockdale found it on dead lime trees in Dominica. Recently, it has been observed in large quantities on dead and dying lime trees, in Montserrat and Antigua, the fructifications being at a height of six inches to 3 feet above the ground. The evidence at least suggests that it may have been responsible for the death of the trees. It was also found in the former island on a dead trunk of the hog plum (*Spondias lutea*), lying among the lime trees.

Other species of Fomes known to be parasitic in the tropics are *F. semitostus*, Berk., which causes the well known root disease of Pará rubber in Ceylon and Malaya, and *F. australis* which has been known to cause the death of *Acacia decurrens*, in Ceylon. All these species are root parasities, and probably commence their attack by spreading from old tree stumps.

Another fungus, *Poria hypolateritia*, Berk., causes a root disease of tea in Ceylon. This fungus has a fructification which is red when mature, and is spread out as a thin crust on the substratum, with the hymenium upwards. It may occur on the surface of the soil near a dead tea bush, or closely addressed to the dead stem, or partly on both. (See Petch. Root diseases of Tea, *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. V, No. 11.) Like the species of Fomes, it commences its attack from dead stumps.

Members of the family Polyporaceae appear to be very common in the West Indies. As has been indicated, they vary much in colour, size, shape and consistency, but may all be recognised as belonging to the family by means of the characters given above. Several occur in connection with dead or dying teees in such a way that there is at least a suspicion that they are responsible for the damage observed. A further knowledge of their numbers and identity would possibly give rise to results of considerable economic importance.—*Agricultural News.*

The Planters' Chronicle.

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(INCORPORATED.)

The Scientific Officer.

Mr. R. D. Anstead, B. A., will leave for Coorg on the 16th instant, simply to attend a meeting of the Coorg Planters' Association at which the question of appointing a Scientific Assistant will be brought up for full discussion.

Seeds.

Stocks of *Coffea robusta* and *Tephrosia purpurea* seeds are exhausted, demand having outrun supply.

Plant Diseases and Pests.

In view of the legislative action under the consideration of the Government of India to prevent the importation of diseases or pests with plants from foreign countries, it is interesting to note that the Secretary of Agriculture, United States, contemplates the introduction of a law that has a very similar purport. At the end of August he distributed a circular calling attention to a Bill he is pressing upon Congress to prevent the importation of insect infested or diseased plants. The Secretary says in the circular :—

" Practically all of the European powers have very stringent plant-inspection laws, and, in the case of the United States, absolutely prohibit the entry of nursery stock. Apples and other American fruits are admitted only when the most rigid examination shows freedom from insect infestation. Canada and other important British possessions have similar protective legislation.

" The United States is the only great power without protection from the importation of insect infested or diseased plants, and thus becomes a sort of dumping ground for European refuse nursery and ornamental stock. This does not often apply to the importations of the larger and reputable importing firms, but does apply to the poorly packed miscellaneous ornamental and other stock imported by department stores of large cities or that sent to this country to be sold under the hammer by auctioneers for whatever price may be obtained.

" The immediate danger which led to the recent effort to secure legislation was the discovery in 1909 of the abundant importation and wide distribution into the United States of nursery stock infested with brown-tail moth nests and occasional egg masses of the gipsy moth. During the years 1909 and 1910 such infested stock was carried into 22 States, covering the country from the Atlantic seaboard to the Rocky Mountains. During the first of these years no less than 7,000 winter nests of the brown-tail moth, containing approximately 3,000,000 larvae, were found in shipments into New York State alone —seed material enough to infest the whole United States within a few years.

"During the second of these years 617 of these nests were found on nursery stock shipped into the State of Ohio, and a much larger number, approximately the same as the year previous, were again sent into New York. Smaller numbers of these nests, proportioned to the amount of nursery stock received, were sent into other States east of the Rocky Mountains during both of these years. Fewer brown-tail moth nests were received during the season just ended (1910-11), owing to the agitation in this country and more strict supervision by foreign governments. These winter nests are, however, still coming in, and the danger is now perhaps even greater, for the reason that as infestation becomes more infrequent a laxity of examination is likely to result."

Turning to the proposed Bill proper, the Secretary explains its provisions as follows:—

"Section 1 provides for importation of nursery stock by the same permit system which has been found perfectly satisfactory in relation to the importation of domestic animals. A certificate of foreign inspection is also required, and, while such certification has not in the past been a guaranty of much value, the agitation of the last two years has given it a much greater value from the European countries from which the bulk of stock is imported, and after the passage of this desired legislation such foreign inspection will doubtless be made so thorough that there will be rarely, if ever, occasion to apply the coercive measure of quarantine. This section has further been amended so that it will not affect importations of plant products solely intended for food, and provides for importation of plants for scientific purposes, and also makes provision for importations from countries where no system of foreign inspection and certification is at present possible.

"Section 2 is a section of notification, and is designed to afford the Government accurate information covering every package of nursery or other plant stock imported for propogation. On the receipt of imported stock at customs, notification is to be made by the agents of the Treasury Department, and subsequently notification is to be made by the broker or other receiver, and finally by the common carrier before transportation is begun. The information thus gained, which puts no unreasonable burden on the importer, will be transmitted at once to the State officials charged with inspection, and will enable full advice to be given concerning all imported stock showing origin and destination. It will eliminate the present danger that much imported stock is unreported and uninspected.

"Section 3 provides merely for the labeling of imported stock as a condition of entry.

"Section 4 is similar to section 3, and provides for similar labeling as a condition for interstate transportation.

"Section 5 provides that the Secretary of Agriculture shall make such rules and regulations as may be necessary for carrying out the purposes of the Act.

"Section 6 makes provision for quarantining foreign districts or particular plant products in foreign districts to exclude diseases or insect enemies which cannot otherwise be kept out of the country.

"This is the provision which has been most objected to by importing nurserymen and especially by importers who have invested in foreign nursery enterprises in France. It is not the intention to apply this section except in the case of diseases or other dangers which cannot be kept out by inspection or disinfection; in other words, at present it would apply only, so

far as we know, to the potato wart disease and the white-pine blister rust. The fears are absolutely groundless that the Department of Agriculture, in enforcing this section, would unnecessarily interfere in any way with legitimate importations of plants, and in those cases where importations carry grave dangers the importers themselves, if honest in their intentions, should be the first to assist in keeping out these dangers.

"This same provision in the law relating to the importation of domestic animals has been the means of safeguarding the live-stock industry of this country, at a saving beyond computation, and there has been no abuse or complaint of abuse of the power thus delegated.

"Section 7 provides for quarantining districts within United States where new diseases or insect enemies have gained a foothold until such districts have been freed from such diseases or insects.

"Referring to the animal law again, a similar provision has been of untold value in the United States in stamping out, for example, the foot-and-mouth disease and in limiting the spread of the Southern cattle fever. In the case of insects, it would enable the Government to stamp out any sporadic infestation of the brown tail moth or gipsy moth, or the potato wart disease, the white-pine blister rust, or the chestnut blight. This section hitherto has not been especially objected to by nurserymen, and is certainly a very essential provision of any measure aimed at the protection of all plant interests.

"Section 8 defines nursery stock.

"Section 9 provides penalties for violations of any of the provisions of the act.

Sections 10 and 11 relate to the appropriation and date when the Act shall become effective.

"This Bill, when it comes before the first regular session of the present Congress will be subject to amendment and a full discussion, and all reasonable criticisms on the part of nurserymen will be considered and if to meet their criticisms the Bill can be amended in any way without losing the protection aimed at it will be so amended."

The admirable organization of the U. S. A. Department of Agriculture on the one hand and, on the other, the proposed legislation on the part of the Government of India to control the importation of plants into this country, cause considerable interest to attach to the manner in which the subject of control of plant importation is being considered in the United States. Moreover the necessity for extending such control to inter-State traffic involves a certain amount of control over pest or disease infested plants already in the country. It is to be hoped, therefore, that at the coming Conference at Pusa, the draft Bill referred to above will be produced and studied: for it can hardly fail to contain clauses that would serve as useful guides for legislators in India, who have to deal with a similar problem to that which their brethren in America are trying to solve. What is given above is a mere précis of the new Bill; its full text has not been received.

Camphor Oil.

Planters who are experimenting with the cultivation of Camphor in India will probably note with interest a statement made in a Consular report from Formosa that "the quality of the trees varies very considerably, those in the north giving as high as 100 parts of camphor to 75 parts of oil, while in the extreme south the quantity of oil obtained to the same quantity of camphor is as high as 400 parts." The opening up of the northern forests, which is being actively pushed, is therefore of great importance. Further, the planting of camphor trees is being encouraged by the Government, seedlings being supplied to farmers from several Government nurseries.

Scientific Officer's Papers.

LXXX.—"SCIENCE AND AGRICULTURE." MISCELLANEOUS ITEMS.

One of the outstanding problems in the study of Rubber is the part played by the latex in the physiology of the plant producing it. A notice of the work of Mr. C. Bernard on this subject appears in the *Experiment Station Record* for June, and his investigations, conducted with a number of species of latex bearing plants, lead him to the following conclusion. "From the action of seedlings of these plants when grown in light and darkness, and from the fact that latex contains a number of compounds such as sugars, starch, fats, and albumenoid substances, it is believed that latex plays an important rôle in the nutrition of the plant and is not to be considered to be a waste of product."

Bulletin No. 2 of the Entomological Series of the Mysore Agricultural Department has recently been published and it consists of an account of the Jola, or Deccan, Grasshopper by Dr. Leslie Coleman. This Grasshopper is not only a new pest, but it is an insect new to Science, and it has been named, in honour of Dr. Coleman who is the first to investigate it, *Colemania sphenarioides.* Besides Jola the insect is reported to attack, "navane (*Setaria italica*), sajje (*Pennisetum typhoidium*), save "(*Panicum miliare*) and ragi (*Eleusine coracana*) with equal severity. "Jola (*Andropogon sorghum*) however, forms the staple cereal of the "infested regions and the damage to it is much more marked.

"Besides cereals, this form also attacks various pulse crops such as "green gram (*Phaseolus mungo*), black gram (*Phaseolus mungo, var.* "*radiatus*) and avare (*Dolichos lablab*) grown in the infested area. It "also feeds upon pige, on pea or togari (*Cajanus indicus*) to a certain "extent. In addition it can occasionally be found feeding on chillies "(*Capsicum spp.*) eating both the leaves and the fruits. The damage "to all these crops is, however, much less severe than that to the cereals "mentioned above."

The Bulletin is beautifully illustrated, and the life history of the insect, which has been carefully worked out, is briefly as follows:—

"The eggs hatch in July after the early monsoon rains have fallen. The young hoppers begin feeding upon the grass at the borders of the fields and upon the young crops, if they have already come up. Growth continues throughout July, August, and September, the grasshoppers assuming the adult form late in October and November. Copulation takes place soon after the adult form is reached and shortly after this, egg-laying begins. This continues through November and into December, during which time the insects are particularly lethargic and very little feeding is done. By the end of December, most of the insects are dead, although a few may be found alive as late as January. The eggs remain in the soil till the following monsoon, when the young hoppers hatch and begin their work of destruction again."

This insect is of great interest as an example of how a new pest may suddenly appear and spread with some rapidity.

Attention has already been called in the *Planters' Chronicle*, (Vol. VI, p. 24) to the danger of the House Fly to public health as a disseminator of enteric and other diseases, and the necessity for the systematic destruction of Flies has been recognised in America and other countries, and a crusade has been organised to deal with this pest. Many of the Scientific Publications recently published contain articles on the subject. The *Popular*

Science Monthly for August calls the House Fly, the "Typhoid Fly," and the author says :—

"It is hardly necessary to dwell at length on the house fly, now known as the typhoid fly, as a factor in the spread of the disease from which it is named. The excellent work of Dr. Howard along these lines, as well as later investigations, has placed the responsibility of one means of dissemination of typhoid where it belongs, and as you well know, although we should still have typhoid if the house fly did not exist, and in spite of the fact that other insects may well carry the germ, the house fly is so evidently the chief offender that the name "typhoid fly," is a very proper one to call attention to the danger of its presence.

"In the eighties the possibility of flies carrying disease germs was called to the attention of physicians and the public. In 1898 we find what is perhaps the first reference to observations on the house fly's frequenting typhoid excreta, and thence flying to food, and the statement that bacterial cultures were obtained from both fly tracks and fly specks. Closely following this, in 1899, came the outbreak of typhoid amongst our soldiers in camp at Porto Principe, and Major Reed's report to the War Department that the epidemic was due to flies. The public then began to turn its serious attention towards the fly question. In 1900 Howard's article, published in the *Proceedings of the Washington Academy of Sciences*, on "A Contribution to the Study of the Insect Fauna of Human Excrement," further emphasized the great danger from the presence of flies in the household, and, as the house fly is the most common fly in that locality, designated that insect especially as an enemy to health. Work of different observers along these lines followed rapidly enough, every year showing additions to the evidence against this common insect, and the campaign against it was inaugurated, but it was not until recently that, as significant of its habits, and in order to help in this battle, the name of "typhoid fly" was suggested and adopted by entomologists.

"We know that it may carry typhoid germs on its feet, on the hairs over its body, and in its alimentary canal, and that these germs may live and be potent for some time even after having passed through its intestine. We know, in view of recent work, that this fly not only breeds in horse manure, but also in human excrement and other forms of filth, and it is a matter of common observation that this insect frequents all kinds of pollution from which it may carry disease germs to human food."

Nature for August 17, reviews several reports on the importance of flies in the conveyance of disease parasites. The first report, by Dr. Copeman, Mr. Howlett, and Mr. Merriman, deals with the range of flight of flies.

"In July last year Postwick, a small village five miles east of Norwich, experienced a plague of flies. No special conditions existed in the village for the breeding of the flies, and attention was directed to a refuse depôt about half a mile distant. The opportunity was taken to ascertain to what distance flies may travel and whether the flies in Postwick were derived from this refuse heap, and if so, whether the flies were merely attracted to it from the surrounding country or whether they were distributed from it as a breeding centre. For this purpose flies were caught in various localities, marked by being shaken with coloured chalk powder, and liberated; subsequently some of the flies were recaptured. The experiments showed that the flies were distributed from the refuse heap as a breeding centre, and that they may travel as far as 1,408 yards from the place of liberation."

The part played by flies in the dispersal of the eggs of parasitic worms, is the subject of another report by Dr. W. Nicoll.

"Many experiments were performed, and it is shown that the ova of several worms may be conveyed by flies, the ova in some cases being ingested, in others merely sticking to the surface of the body. Those adhering to the body are generally got rid of within a short time, but when ingested they remain for two days or more in the intestine. The habit of flies of feeding in turn on excrementitious material and on human food stuffs obviously suggests that house-flies may play a part in the dissemination of infection of parasitic worms. Dr. Graham-Smith describes further observations on the distribution of bacterial infections by house-flies and blow-flies. It is definitely shown that both are capable of infecting fluids, such as milk and syrup, on which they feed and into which they fall. With house-flies gross infection may be produced for at least three days, and a smaller degree of infection for ten days or more. Blow flies may carry the infection longer, up to three or four weeks."

An accouut of the Scheme for Agricultural Research to be adopted in England appeared in the *Daily Telegraph*.

"The scheme provides for :—

1. A system of agricultural research which will secure for each group of the problems affecting rural industry a share of attention roughly proportional to its economic importance.

2. The concentration of the scientific work on each group at one institution or at institutions working in combination.

3. Grants for special investigations for which provision may not otherwise be made.

4. The grant of scholarships, with a view to the increase of the number of men fully qualified to undertake agricultural research.

5. The carrying out of investigations into problems of local importance, especially those involving the application of modern research to local practice, and the provision of scientific advice for farmers on important technical questions.

"In making arrangements for the separate investigation, as far as possible, of each group of allied subjects, the Commissioners and the Board have been impressed with the importance of securing continuity in work which is necessarily of considerable duration, and at the same time of providing staffs of specialists and experts, who will be permanently engaged on work arising from the investigation of the same group of problems. By this means, concentration and economy of effort will be better secured than it would be if a number of institutions were dealing at the same time with the same group of problems.

"It is neither desirable nor possible to prevent all overlapping or duplication of work, but it is obviously necessary to proceed on a plan by which research work subsidised from public funds will not be unnecessarily duplicated. It is, desirable, too, to arrange that each problem shall be undertaken by the institution best fitted to deal with it, and usually by the institution which has specially devoted its attention to problems of an allied nature. It is also important to avoid the giving of undue attention to one part of the field of agricultural research to the exclusion of other parts, which are of equal scientific and economic importance."

RUDOLPH D. ANSTEAD,
Planting Expert.

DISTRICT PLANTERS' ASSOCIATIONS.

Shevaroy Planters' Association.

Proceedings of the Annual General Meeting, held at Victoria Rooms, Yercaud, on 3rd October, 1911.

PRESENT.—Messrs. S. Campbell, F. Carey, R. A. Gilby, S. M. Hight, W. W. Hight, A. B. Kundaswamy, C. G. Lechler, C. Rahm, W. Rahm, F. D. Short, B. N. Short, W. Reilly, J. Williams, and Ch. Dickins (Honorary Secretary and Chairman).

I. The Notice calling the meeting was taken as read.

II. (*a*) Passing of Accounts. (*b*) Honorary Secretary's Report (*c*) Delegate's Report.

(*a*) The accounts were audited by Messrs. C. Rahm and B. N. Short, showing a balance in hand of Rs.129-13-10 up to the end August 1911 and 160 bamboo permits @ 2as. each.

(*b* and *c*). The Honorary Secretary read his annual report and his report in connection with the late U. P. A. S. I. Meeting. Proposed by Mr. F. D. Short, seconded by Mr. C. G. Lechler and carried unanimously: That the reports he adopted, printed and circulated to members.

III. *Roads.*—Read letter dated 14/8/1911, from Mr. C. G. Lechler complaining about the bad state of certain Union Roads in Yercaud.

Resolved.—That the Honorary Secretary be requested to write to the Chairman, Yercaud Union, drawing his attention to the bad state of some of the Union Roads, at the same time urging upon him the necessity that lantana should be kept well back from the drain, thereby allowing the rain water to flow freely.

VI. *Breach of Contract Cases.*—Read letter dated 25/9/1911 from Mr. W. W. Hight, bringing to the notice of the Association that cases tried before the Dn. Tahsildar, Yercaud, have in his estimation (W. Hight's) been thrown out on trivial points.

Resolved.—That the matter be deferred for future consideration.

V. (*a*) Election of Office Bearers, (*b*) Election of Hon. Secretary.—

(*a*) The following gentlemen were elected to serve on the Committee for the coming year:

Messrs. J. C. Large, F. D. Short, C. G. Lechler, C. Rahm, S. M. Hight, W. Rahm, Rev.—Rochet.

(*b*) Mr. C. Dickins was elected Honorary Secretary and Chairman.

VI. *Vote of Thanks.*—Proposed by F. D. Short, seconded by Mr. C. G. Lechler, and carried unanimously:

That a vote of thanks be accorded to the Honorary Secretary for his past year's services, also for representing this Association at the late U. P. A. S. I. meeting and for his report.

The meeting then terminated.

(Signed) CH. DICKINS,
Hon. *Secretary.*

CORRESPONDENCE.

Nitrolim.

Dear Sir.—In the *P. C.*, Vol. VI, No. 38 there are some results of fertilising wheat with "Nitrolim" forwarded by Messrs. Peirce, Leslie & Co., Ltd.

The results were as follows :—

Wheat	Unmanured	Crop value Rs.31-1-10
do.	Nitrolim 20 lbs. costing Rs.10.	Rs.36-2- 4

so that deducting Nitrolim costing Rs.10 the value of the crop was really Rs.26-2-4, or Rs.2-15-6 less than the unmanured plot !

Again, the plot manured with 40 lbs. Nitrolim gave crop valued at Rs.39-5-9, which after deducting the cost of "Nitrolim" Rs.20 leaves Rs.19-5-9, or Rs.11-12-1 less than the unmanured plot !

The experiments with unirrigated Linseed gave almost similar results, *viz* :—

Unmanured plot gave crop valued at	Rs.18	10	6
Manured with 20 lbs. Nitrogen from "Nitrolim" ...	„ 21	5	4

Deducting the cost of "Nitrolim" Rs.10 leaving a balance of Rs.10-5-4, or Rs.8-5-4 less than the unmanured plot gave.

Manured with 40 lbs. Nitrogen from "Nitrolim" gave Rs.19-10-8, which deducting the cost of "Nitrolim" applied Rs.20 gave a *loss* of Rs.0-5-4.

Linseed irrigated, the unmanured gave	Rs.18	10	8
Manured with 20 lbs. Nitrogen from "Nitrolim" gave..	„ 22	10	8

Deducting the cost of "Nitrolim" Rs.10 leaves Rs.12-10-8 or Rs.6 less than the manured plot.

The extract says that "These experiments indicate that 'Nitrolim' is an excellent manure for this product and encourages the hope that it may prove beneficial for Coffee and Tea."

Unless my deductions and figures are wrong, I cannot see that the hopes are very encouraging and I think Planters had better wait till experiments undertaken under the guidance of the Scientific Officer with "Nitrolim" show that it is "An excellent fertiliser."

It is very expensive and its value for Coffee is at present an unknown quantity. 2 tons of ground nut cake at Rs.90 per ton and ⅓ ton of Lime at Rs.21 per ton approximately gives the same analysis, costs less, and we certainly know the result.

Whilst on this topic, may I ask the Scientific Officer to kindly let me know what the difference between Calcium Cyanamide, Nitrate of Lime, and Nitrolim is ?

I see that Nitrate of Lime gives 13% at Rs.170 per ton and Nitrolim at Rs.200 per ton 18% of Nitrogen, being about Rs.2 per unit in favour of Nitrolim. Are they not all Calcium Cyanamides ? or is it only a "distinction with a difference" as a well known Planter said ?

"NITROROT."

[*Note by the Scientific Officer.*—"Nitrorot" has entirely misunderstood the meaning of the last column in the Table of Results referred to. "Value realised per acre" I take to mean not the value of the crop, but the *Profit* obtained after the cost of nitrolim and other fertilisers, labour, &c., has been deducted. Consequently "Nitrorot" is deducting the price of the nitrolim twice over.

The results show that by applying 40 lbs. of nitrogen per acre as nitrolim, a profit of Rs.45 is obtained as compared with a profit of Rs.31 when no manure is applied.

I agree with "Nitrorot" that the value of nitrolim for coffee is at present an unknown quantity. It is for this reason that I am having trials of it made in different districts. Though expensive, its cost per unit of nitrogen (obtained by dividing the cost per ton by the percentage of nitrogen present) is less than that of the sources of nitrogen usually used on estates, as shown in the following table:—

Fertiliser.	Cost per ton.	Percentage of Nitrogen.	Value of a unit of Nitrogen.
	Rs.		*Rs. a. p.*
Nitrate of Soda ...	230	16	14 6 0
Sulphate of Ammonia ...	250	21	11 14 5
Nitrolim ...	200	18	11 1 9
Ground nut Poonac ...	90	8	11 4 0
White Castor Poonac ...	75	6	12 8 0
Black Castor Poonac ...	60	5	12 0 0

Nitrolim is not strictly comparable with Poonacs as a source of Nitrogen, because the latter supply Humus and belong to a different class of Fertilisers, while it has the advantage over Nitrate of Soda and Sulphate of Ammonia of containing free Lime and yielding an alkaline residue in the soil instead of an acid one.

Calcium Cyanamide and Nitrate of Lime are different substances, both being made from the Nitrogen in the air, but by different processes. Nitrate of Lime explains itself; it is like Nitrate of Soda, the Soda being replaced by Lime, and its chemical formula is $Ca\ (NO_3)_2$. Calcium Cyanamide is the substance formed when Calcium Carbide (familiar from its use in acetylene lamps) combines with Nitrogen. Its chemical formula is $CaCN_2$. Nitrolim is the trade name of crude Calcium Cyanamide and contains about 59% of the pure body, so for practical purposes Calcium Cyanamide and Nitrolim may be considered as the same thing.

Nitrate of Lime and Nitrolim have a different composition and contain different proportions of Nitrogen. Their effects upon cereal crops, at any rate, appear to be much the same, but Nitrate of Lime has the defect of being rather deliquescent, that is it absorbs moisture from the air (as salt does) and becomes lumpy, or even liquid in time. Hence it cannot be easily stored for any length of time and it is difficult to use in any mixtures of fertilisers. Further information on this subject will be found in the "Selected Cutting" in this issue.—R. D. A.]

Bonus on Green Tea.

Dear Sir.—My attention has been drawn to the fact that the Delegate representing the Anamalai Planters' Association at the Meeting of the U. P. A. S. I. recently concluded, opposed the granting of a "bonus" on green Teas on behalf of his Association. As representing the only Tea producing Interests in the District and having supported the granting of this "bonus," it might easily appear to others outside, who knew this to be so, that our action was contradictory and indeed I have been reproached as a backslider in this matter.

The facts are that as far as Tea interests in the District are concerned, ours predominating, the District should have been a supporter and not an opposer, but the chairman evidently thought it expedient at the District Meeting for reasons best known to himself and his friends to invoke the aid of the purely Coffee Estates to throw in their votes, which I cannot hold is "playing the game." I understand that on questions affecting Tea interests only it has never been the custom of the Mysore or Coorg planters to enter the arena.

O. A. BANNATINE,

Managing Director.

The U. P. A. S. I. Exhibition.

Dear Sir.—In the account of the exhibits of coffee at the late U.P.A.S.I Exhibition in the *P. C.*, Vol. VI, No. 36, I see an exhibit by Messrs. J. G. and F. Hamilton, South Mysore, of "Arabian-Bassanhulli." Can the Messrs. Hamilton or any of your readers tell me what this variety is and where it is grown? I have spent quite a number of years as a coffee planter in Mysore but have never heard of this variety. Is it one of the many hybrids or cross fertilised plants one hears of at frequent intervals, seeds of which the producers boom, are able to sell at fancy prices, and which the buyer has hitherto planted to root out later on as useless?

IGNORAMUS.

Labour.

Dear Sir,—My Proprietor writes me as follows:—

"I wonder how it is in Ceylon and Malay, Indian labour is fairly easily procurable through recruiting Kanganies (at I admit a higher rate than you pay) and that we hiring in India are unsuccessful. Can you explain?"

I should be very glad to get the opinion of others, as I am credibly informed men's wages in Ceylon 2 years since were about 5 annas and we in Coffee pay 4 annas.

MYSORE PLANTER.

LIBERIAN COFFEE.

The coffee-plant flourishes and reaches a size in Liberia to be found in no other part of the globe. The berries are larger and richer than those produced in any other country, and when properly cured, possess the most delicious aromatic flavour. In Liberia two crops are gathered each year, one during the rains and the other during the dry season. The rains begin in April and May and close in October and November. The chief and most important coffee crop is gathered during the dry season, *i.e.*, in the months of December, January and February. When the coffee is picked the berry is usually crushed in a mill or mortar, and then spread on the ground in the sun in a prepared place until well dried. Every evening the coffee is removed in order to avoid its getting wet from rain or dew. When dried it is beaten in a mortar until all the pulp is entirely separated from the beans. It is finally cleaned by fanning, and some of the planters grade it by removing all broken and undeveloped beans. Liberian coffee is very strong, and is therefore used in Europe to give strength to weaker coffees. As generally prepared, it has a little bitterness in its flavour, and it is therefore often mixed with other coffees to overcome this.—*The Journal of the Royal Society of Arts.*

TEA.

In Formosa, 1910.

A consular report states that 18,000,000 lbs. of Oolong, valued at £450,000, were shipped during the season and 6,230,000 lbs. of Pouchong, valued at £197,000.

Oolongs.—With the exception of 717,000 lbs. shipped to London and 211,000 lbs. to Australia, the whole of the Oolong tea went to America. Practically the whole export went from Keelung, which has become a regular port of call during the tea season for the Trans-Pacific liners on their way from Hong-Kong to Japan. Owing to the high rate charged by the Japanese steamship line running from Tamsui to Hong-Kong, *viz.*, $3\frac{1}{2}$ yen (say 7*s.* 2*d.*) a ton to Hong-Kong, steamers find it to their advantage to call at Keelung for even 100 tons of tea for Suez route, calling there after Foochow on the passage from Shanghai to Hong-Kong. Most steamers get 200 tons or so, and the cost of calling at Keelung is 5 sen a ton registered tonnage harbour dues pilotage. The entire shipments formerly went from Tamsui to London *via* Hong-Kong. Some 8,731,000 lbs. were shipped to the United States by the Pacific route, approximately 4,000,000 lbs. being in Japanese. 2,793,000 lbs. in American and 1,438,000 lbs. in British vessels.

The rates of freight were as follows:—To New York from Keelung *via* Pacific, $\frac{3}{4}$*d.* per lb. gross; to New York from Keelung *via* Suez, £1 17*s.* 6*d.* per ton (40 cubic feet); to London from Keelung or *via* Amoy and Hong-Kong £2 5*s.* per ton (40 cubic feet). The rates *via* Suez are subject to a rebate of 10 per cent.

The Oolong tea export trade is in the hands of three British and five American firms.

The season of 1910 opened towards the end of April, being somewhat earlier than the previous year. The crop was of fair average quality and rather better than that of 1909. Some confusion resulted by the standard adopted by the United States Government being of higher quality than the lowest grade of leaf produced, and during the season about 2,000 half-chests were rejected, causing considerable loss to shippers. These were re-shipped to London.

Supplies were abundant all through the season. Prices here for the lower grades ruled comparatively high during the season, those of the finer sorts being correspondingly lower owing to a larger quantity being held over in the consuming centres.

Pouchongs were produced in increasing quantities, and the total supplies of Oolong were thereby affected to some extent.

The abolition on November 1, 1910, of the export duties which were levied on shipments of certain products from Formosa to foreign countries, has relieved Oolong teas of a charge of 1 yen 60 sen (3*s.* $3\frac{1}{4}$*d.*) and Pouchong teas of 1 yen 20 sen (2*s.* $5\frac{1}{2}$*d.*) per 100 kin (133 lbs.)

Black tea.—The output of black tea, the manufacture of which was commenced in 1909, was in that year 193,151 *lbs.*, valued at 3,413 *lbs.* Of this quantity, 124,249 *lbs.* were exported to Russia *via* Odessa, the balance to Japan.

The output in 1910 was 153,210 *lbs.*, valued at 3,347 *lbs.*, of which 86,720 *lbs.*, valued at 2,371 *lbs.*, were exported to Russia, the balance to Japan.

The Government tea experimental factory at Anpingchin was during 1910 handed over to a Japanese company, with a capital of 100,000 *lbs.*, of which 25,000 *lbs.*, is paid up.

Its last year's working does not appear to have been successful, the price obtained for its black tea in Russia being insufficient to pay the cost of manufacture.

The Government aid given to this company is reported to be as follows:—

(1). The use of the Government experimental factory rent free.

(2). A subsidy of 6 per cent. on the paid-up capital for a period of five years.

(3). A subsidy of 30,000 yen for expenses in extending the markets for black tea. This has been reduced by one-half in the budget for 1911-12.

Shanghai's Tea Trade.

H. B. M. Consul at Shanghai reports as follows regarding the local Tea Trade in 1910:—

Black teas.—The great bulk of the black teas is shipped from Hankow direct and only a comparatively small proportion, confined to the lower grades, comes to Shanghai, so that some of the following remarks apply rather to the Hankow market than to Shanghai. The quality of the Hankow teas was distinctly good during the past season, whilst Kiukiang teas were only fair. Oan Fas were of exceptionally high quality, but it is to be feared that this can only be attributed to unusually favourable weather conditions and not any improvement in the methods of cultivation in this district. The results of the year's trading have been fairly satisfactory to merchants, but the profits cannot be considered commensurate with the risks.

A considerable increase in the shipments to the United Kingdom is to be noted, as a result of the shortage of Indian and Ceylon teas, the lower grades of China tea being extensively used in the preparation of the cheapest blends for the British market. The finer growths of Chinese teas would also appear to be growing in favour in the United Kingdom, but not to any marked extent.

Green teas.—Whilst Shanghai takes only a small share in the export of black teas, it is the export port for practically all the green tea shipped from China. The quality of the tea shipped during the past season was fair, and prices were about on a level with those obtained in recent years. The price of the teas in demand for Western Asia has been high, and in this trade there has been a great expansion, pointing to a steady increase in consumption.

Shipments to the Continent of Europe have been rather smaller but the results have been more satisfactory to merchants than in the previous season, when exports exceeded market requirements. London shows no sign of regaining her position as the chief distributing centre for Europe and Northern Africa.

The export to America was less than in the previous year, the consumption of green tea showing no sign of expansion and the trade having been somewhat affected by exceedingly severe tariff regulations governing the import and artificially-coloured tea. The United States Government has now decided that no artificially-coloured teas are to be admitted, and in view of the fact that in recent years some 15,000,000 lbs. of artificially-coloured teas have been shipped annually from Shanghai, it will be interesting to see what steps will be taken by growers to meet the new conditions.

SELECTED CUTTINGS.

Preparation of Calcium Cyanamide and its Use as a Manurial Agent.

In almost every part of the world where agriculture is an important industry, attention is at present being given to the question of obtaining increased yields of agricultural products. For this purpose, researches are being made in several different directions. In the first place, investigation is being vigorously prosecuted towards the breeding of strains of plants, which will give higher yields of staple products than are obtainable from existing varieties, and such work has already given excellent results in the production of more prolific strains of wheat, cotton, and other agricultural products. In this branch of work may also be included the experiments designed to produce disease-resistant crops, since the ultimate object is to avoid loss of produce as the result of disease. In this category also must be included the attempts now being made, often with marked success, to breed plants which will ripen and bear crops under adverse climatic conditions, since in this way it is possible to bring into cultivation land formerly regarded as useless for this purpose.

Concurrently with these important investigations, attention is being given to the question of how to prevent the fall in productivity of land which has been long under cultivation. This is primarily a matter of supplying, as cheaply as possible, to such land those elements which are of first importance in the nutrition of plants. One of the most important of these constituents is nitrogen, and since there exists in the atmosphere an unlimited supply of this material, the problem resolves itself into one of cheaply converting the nitrogen of the air into a form in which it can be used by plants. This is already done on an immense scale, indirectly, by making use of leguminous plants, which have the property of developing certain structures on their roots, which by the agency of bacteria absorb the nitrogen of the air and store it in a form in which it can be used by other plants.

This process, however, is a slow one, and is of limited applicability, and consequently investigators have endeavoured to find much more rapid methods of "fixing" atmospheric nitrogen with a view to the production of nitrogenous manures, which could be applied to the soil in the usual way. One of the most important advances made in this direction was that of Frank and Caro, who discovered that when nitrogen is brought into contact with calcium carbide under suitable conditions, combination takes place, and calcium cyanamide is formed in accordance with the equation $CaC_2+2N = CaCN_2+C$ (calcium carbide+nitrogen=calcium cyanamide+carbon). Calcium cyanamide is a dark, slate-coloured, crystalline product, moderately soluble in cold water. The primary object of the company, formed to exploit this discovery, was the manufacture of calcium cyanide from the cyanamide for use in the gold industry, but it was soon recognised that the high nitrogen content of the material might render it suitable for use as a nitrogenous manure.

The first works for the production of calcium cyanamide or "nitrolime," on an industrial scale, were started at Piano d'Orta in central Italy in 1906, and these had an estimated annual output of 3,000 tons.

The following list of works now in operation, or under construction, and their estimated annual output, serve to indicate the rapid growth of the industry.

Those now in operation are:—

	Annual capacity tons.		Annual capacity tons.
Piano d'Orta ...	5,000	Ontario ...	5,000
Westeregeln ...	5,000	Kinru ...	4,000
Odda ...	12,000	Terni ...	4,000
Knapsack ...	5,000	Sebenico ...	4,000
Bromberg ...	3,000		
Martigny ...	3,750	Total ...	54,500
Notre Dame de Briancon...	3,750		

The works to be completed early in 1911 include those at Trosberg (12,500 tons) and St. Marcel (3,000 tons), whilst by the end of that year those at Almissa (4,000 tons) and at Marblerocks near Nerbudda, Central Provinces, India (4,000 tons), are to be ready.

MANUFACTURE OF CALCIUM CYANAMIDE.

This is usually accomplished in two stages, (1) the production of calcium carbide by the interaction, in the electric furnace, of anthracite and lime, (2) the formation of calcium cyanamide from the carbide by heating the finely-powdered material in a current of pure nitrogen. The manufacture of calcium carbide is too well known to need any description. The carbide, after cooling during 8 to 12 hours, is ground to a fine powder in ball mills, and then charged into retorts, which can be uniformly heated electrically, by means of central carbon resistances, to a temperature of 800° to 1,000° C. The carbide powder is charged into each retort to the extent of about 300 kilograms. The lids of the retorts are made air-tight, nitrogen under pressure is admitted and the retorts maintained at the required temperature for about 45 hours, the pressure of nitrogen being maintained throughout the operation. The cyanamide thus produced, after being allowed to cool in an inactive atmosphere, is finally ground and is then ready for sale. According to recent investigations the absorption of nitrogen by the carbide is much facilitated by the presence of some salt of calcium not containing oxygen. Thus a mixture of 77 per cent. of calcium carbide with 23 per cent. of calcium chloride absorbs nitrogen at 700° to 750° C., and such a mixture is in use. The objection to this addition is the fact that the final product containing calcium chloride is hygroscopic. It is necessary that the nitrogen employed should be of a high degree of purity, and to attain this, atmospheric air is subjected to either the "Linde" or the "copper" process for the removal of oxygen. The "Linde" process depends upon the fact that liquid nitrogen boils at—196° C., and liquid oxygen at —185° C. The air is drawn through two towers, down which soda liquor is allowed to trickle in order to remove the carbonic acid, and is next compressed under 4 atmospheres pressure (57 lb. per square inch) and cooled by passing through pipes, around which flows cold oxygen from later stages in the process. The compressed cooled air passes to an ammonia cooler where its temperature is further reduced to—20 C., whereby the remainder of the moisture is removed, then through coils cooled by gas slightly above the boiling-point of liquid nitrogen, and finally through coils in a tank of liquid oxygen, which liquefies the air, as it is still under pressure. The liquefied air is next allowed to expand through a throttle valve to atmospheric pressure, and the liquid thus produced is led into the top of a rectifying column where the oxygen is condensed and practically pure nitrogen gas passes over to the compressors. The alternative, "copper," method consists in passing air over heated metallic copper, which combines with the oxygen, leaving the nitrogen free. The copper oxide produced can be reconverted to the metal by heating in coal gas.

Processes have been patented and tried for the production of calcium cyanamide from lime, coke, and nitrogen in one stage, thus omitting the cooling and grinding of the calcium carbide. It has been found, however, that the conversion of the calcium carbide to calcium cyanamide is more efficient and rapid if the calcium carbide is finely ground before being submitted to the action of nitrogen. It is stated that some of the works producing calcium cyanamide are installing plant for the conversion of part of their product into sulphate of ammonia by treating it with superheated steam and then absorbing the ammonia thus produced in sulphuric acid.

An American estimate of the cost of plant necessary for the production of 10,000 tons of cyanamide per annum is £92,500. This estimate assumes that the necessary power is obtained from a subsidiary company. If power can be obtained at about 2*s.* 7*d.* per H. P. per annum, the cost of production is, including interest on the capital outlay, estimated at £9 per metric ton. From the above details it is evident that in order to manufacture calcium cyanamide to compete with other nitrogenous manures, cheap water power for the production of electricity is an essential factor, as in the fixation of 1 ton of nitrogen 2 kilo-watt-years of power are consumed.

Composition of Calcium Cyanamide

The product offered for sale in Europe contains from 57 to 63 per cent. of cyanamide and a large quantity of free lime. A sample examined by Voelcker in this country gave the following percentage results:—

Calcium cyanamide ...	58·91*	Ferric oxide and alumina ...	2·44
Free Lime ...	23·55	Silica ...	2·19
Magnesia ...	0·05	Free carbon ...	12·86

*Equivalent to 20·62 per cent. of nitrogen.

The products now on the market are stated to be free from carbide, which was not the case with the earlier products. In the United States Calcium Cyanamide is met with in several forms. Usually the product of the composition shown above is known as "nitrolime;" whilst a material obtained by subjecting this to special treatment, which includes hydration of the caustic lime, is sold as "improved cyanamide;" it has the following composition:—

	Per cent.		Per cent.
Calcium cyanamide ...	29·26	Alumina ...	1·37
Calcium carbonate ...	0·21	Ferric oxide ...	0·69
Calcium nitrate ...	20·06	Free carbon ...	7·89
Calcium hydroxide ...	28·78	Silica ...	1·03
Sodium cyanamide ...	10·38		
		Total nitrogen...	17·01

Another form, which finds employment in the United States, is a product having the composition given above mixed with peat in order to reduce the "total nitrogen" to 10 per cent. This is used for compounding with wet manures, such as wet acid phosphate, tankage, etc., and is known as "complete ammonia dryer."

It should be understood that these products are only in use in the United States to any extent, and the results of experimental trials given in this article refer to the use of raw cyanamide.

Use of Calcium Cyanamide in Complete or Compounded Manures.

This is an important matter for farmers, as it is frequently necessary to use a phosphatic as well as a nitrogenous manure. When calcium cyanamide was first introduced, it was frequently stated that it could not be mixed

with superphosphate owing to its causing "reversion" of the phosphate and losing nitrogen; but experiments have shown that the quantity of nitrogen lost is of little importance provided that the weight of cyanamide present in the mixture is less than half the weight of superphosphate. Admixture of 1 part of calcium cyanamide with 10 parts of superphosphate, results in the conversion of all the "water-soluble phosphoric acid" into "citrate soluble," and of 1 part with 5 parts of superphosphate leads to the change of the whole of the phosphoric acid into dicalcium phosphate, which is soluble in citric acid. Experiments carried out with *Brassica chinensis*, at the Imperial College of Agriculture, Tokyo, indicate that calcium cyanamide is more effective when mixed with superphosphate than with a neutral phosphate as the acid phosphate neutralises the ammonium carbonate produced in the soil.

A mixture of 1 part of cyanamide with 5 or 10 parts of superphosphate forms a good fertiliser for barley or turnips and can easily be made, if water is judiciously added at the time of mixing, in just sufficient quantity to slake the lime. Such a mixture with superphosphate does not cake, but remains quite loose and friable. In general, calcium cyanamide can be mixed with any manure with which it is customary to mix nitrogenous manures, *e.g.* potash salts, basic slag, superphosphate, &c.

It is also stated that mixtures, within certain limits, of this manure with nitrate of soda and acid phosphate do not lose nitrogen from the nitrates as would be the case in the absence of calcium cyanamide. This is accounted for by the fact that any nitric acid liberated from the nitrate of soda is immediately fixed by the free lime of the calcium cyanamide forming nitrate of lime.

With regard to the storage of this manure, experiments made at the Rothamsted Experimental Station have shown that, as it is now sent out, packed in double paper or jute sacks there is little loss of nitrogen due to the action of atmospheric moisture. Experiments carried out over a period of 20 weeks showed that, when stored in a shed in bags, the gain in weight amounted to only 5 per cent. The quantity of calcium carbide found in the samples examined was below 0·1 per cent., showing that there was no danger of fire from the production of acetylene by the action of moisture on the unaltered carbide.

Utilisation of Calcium Cyanamide as a Manure.

The first change which takes place when cyanamide is placed in the soil is the slaking of the free lime and the formation of calcium carbonate by its combination with the carbon dioxide of the air. Various theories have been advanced as to the mode of decomposition of cyanamide in soil. It has been shown that water converts calcium cyanamide into dicyanamide $(CN.NH_2)_2$, and that under favourable conditions the nitrogen is completely changed, by certain bacteria occurring in the soil, into ammonia. In sterile soils, however, this reaction does not occur to any appreciable extent.

A long series of experiments carried out by Olpiani showed that urea is produced by the action of soil on cyanamide, and that in the second stage carbonate of ammonia is formed. That the absorptive power of the soil for moisture has an important bearing on the rapidity with which the calcium cyanamide becomes available for plant nutrition has been shown by numerous experiments, soils of high absorptive power being the more active. The ammonia eventually liberated is fixed by the organic constituents of the soil, and is then slowly converted by nitrifying bacteria into nitrates.—*Bulletin of Imperial Institute*, Vol. IX, No. 1, 1911).

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The Mysore Dasara Exhibition.

From the following extract from the Award List it will be seen that at the above Exhibition a Gold Medal was won by the U.P.A.S.I. for a General Exhibition of Planting Products, while various planters' exhibits received honourable mention.

It may be stated also that The Presidency Manure Works, of Ranipet, (Managing Agents—Messrs. Parry & Co.,) and Messrs. Peirce, Leslie & Co., Ltd., of Calicut, each received a Silver Medal for exhibits of Fertilisers. The latter firm's display formed a part of the Planters' Section.

Comment on that section is again reserved, pending receipt of a report from the Scientific Officer, who attended the Exhibition on the closing day (Tuesday, the 17th) *en route* to Mercara, received the Gold Medal that was presented to the U. P. A. S. I., and, by special request, showed H. H. the Maharaja of Mysore and his brother, H. H. the Yuvaraja, round the Planters' Section and explained the exhibits.

EXTRACTS FROM THE AWARD LIST.

Section A.—Class II—Plantation and Garden Products.

Rubber.—Periyar Rubber Co., Ltd., Cochin, Honourable mention.

Ceará Rubber.—L. E. T. Short, Shevaroys, Honourable mention.

Pepper.—Mr. E. M. Playfair, South Mysore, Honourable mention.

Coffee.—Matheson's Works, Hunsur; and Mr. F. M. Hamilton, South Mysore, Honourable mention.

Cardamoms.—Mr. W. L. Crawford, Oosoor Estate, Honourable mention.

Tea.—Travancore Tea Estate Co., Ltd., South Travancore, Honourable mention.

Camphor.—Mr. N. G. B. Kirwan, Bababudin, Honourable mention.

General Exhibition of Planting Products.—United Planters' Association, South India, gold medal.

The International Rubber Exhibition, 1911.

In the course of "A short Criticism of the Exhibits" from various countries, Messrs. Lewis and Peat, of London, remark :—

"We feel we must begin this little criticism by congratulating Planters on the excellent quality and condition of practically all the samples sent in for the exhibition. The improvement on the preparation against the last exhibition is the most striking feature. The bulk of the samples of Hevea shown were in Blanket Crepe form, and nearly all were well nigh perfect.

We are still of the opinion as expressed in our Details for Planters, published in January, that the two best forms of preparation most suitable for the market and the most readily saleable are Blanket Crepe and Smoked Sheet, and at this Exhibition, practically all the Estates, both Ceylon and Malaya, sent most excellent exhibits prepared in either or both of these two ways. Colour is not of such importance as formerly in 1st latex Rubber, but oil stains and any admixture of scrap, cupwashings or lower grades is very strongly objected to. Also scrap and bark or shavings rubber must be kept separate and all made into thick Gristly Crepe.

"We cannot say much yet about Smoked Crepe as comparatively little has been sent so far, but this grade is shortly to be admissible on 1st latex contracts and is fetching very similar prices as Unsmoked Crepe or Sheets at Auction. Up to now the parcels sent have been inclined to be sticky, especially when the crepe is thin, and care must be taken to make the smoked, when it is finished, quite as thick as the unsmoked.

"Owing to the much larger quantity of Smoked Sheet coming to the market, the premium ruling until quite recently has practically disappeared, but the grade is as popular as ever, and as readily saleable as any other make offered. The use of heavily ribbed rollers has done a great deal to improve the condition, and we see very little mouldy now and practically no stuck and heated smoked sheets.

"Scrap in good gristly blanket form is in great demand, and fetches much better prices than in the loose form."

The same brokers say of the

SOUTH INDIA COURT:

"Although only a few samples of rubber were shown in this court, there were quite enough to show what can be done and the possibilities of the country.

"Most of the exhibits were of Ceará Rubber and nearly all well prepared, but probably owing to the youngness of the trees or may be insufficient washing, they all showed much too much resin. No Ceará Crepe was shown, and this species in thick blanket from almost white in colour is being made by estates, elsewhere and is doing very well on the market. Smoking, too, is good and believed by some to greatly reduce the resin.

"Special mention must be made of an excellent sample of Unsmoked Hevea Sheets from Palapilly Estate of the Mooply Valley Rubber Co., which was one of the finest in the whole Show.

"Siltar [Sittar] Estate showed some very fine Hevea Blanket Crepe and Vandaloyda Estate some good Smoked Sheet.

"Altogether the quality and preparation of the Southern India Rubber was very satisfactory and bids well for the future.

"Kutikul Estate (Mundakayam Valley Rubber Co.).

Very good clean amber Hevea sheet, well prepared and in good condition, above fair average quality.

"Maryland Estate (L. E. T. Short).

(a) Fair clean dark Ceará sheet, but very resinous. Strong and in good condition.

(b) Fair clean dark Ceará sheet, light colour. A very fair sample, but rather soft and inclined to stick. Too resinous, probably insufficiently washed.

(c) Fair to good amber Ceará biscuits, well prepared and in excellent condition. Rather too resinous when stretched, otherwise a very good sample of this grade.

(*d*) This pale Ceará sheets, well prepared and in excellent condition. Rather too thin but a very good sample.

" Utollalu Estate (Mysore District, Southern India).

Ceará biscuits, brownish and dark brown and dull, fairly tough but very resinous when stretched. All very sticky and soft, probably insufficiently washed or may have been exposed to the sun—otherwise very fairly well prepared. Should advice smoking if any difficulty found in drying naturally.

" The Coorg Estates Co., Ltd.

(*a*) A small box of thin dark brown smoked Ceará sheets, well prepared, well smoked and in fair condition, but much too thin and many stuck. Fairly strong but very resinous.

(*b*) Fine pale Ceará sheets, well prepared and in excellent condition, but very resinous. A very good exhibit. Also a few rather rough biscuits, also good, but not as good as the sheets.

(*c*) Good clean Rambong scrap, in good condition. We would recommend thick crepe form rather than scrap if the bright pink and red colour is not lost.

" Vandaloyda Estate.

Fine smoked Hevea sheets, very well prepared and in excellent condition, amongst some of the best smoked sheets at the exhibition. Would recommend ribbed rollers to corrugate the rubber to allow free passage of air in the cases when packed. A little more resinous than it should be.

" Siltar [Sittar] Estate (Rani Travancore Rubber Co., Ltd.).

(*a*) Fine amber thin blanket crepe, in good condition. A really fine sample of Hevea and a favourite quality with the trade.

(*b*) Good amber Hevea sheets, fully fair average sheets. A very good exhibit.

(*c*) Black smoked Hevea crepe, rather dull, but strong and in good condition.

" Yendayai [Yendayar] Estate (J. J. Murphy, Esq.).

Fully fair average sheet, in good condition and the right thickness.

" Palapilly Estate (Mooply Valley Rubber Co.).

Very fine light amber sheet, splendidly prepared, strong and in excellent condition. One of the best samples of Unsmoked Hevea sheet in the show.

" Stagbrook Rubber Estate, Ltd.

Dark amber Hevea sheets, well prepared and in good condition, but a little softish and brittle, otherwise fully fair average quality of the grade. Also small sample of fair crinkley scrap, but much too barky.

" Aneikolan Estate (Orkaden Rubber Co., Ltd.).

Fine bright golden thin blanket crepe well prepared and in good condition. An excellent sample of its grade.

" Radamankolam Estate (Travancore Rubber Co., Ltd.).

Fair average amber Hevea sheets, well prepared and in good condition, but a little softish and weak, probably owing to the youngness of the trees. When stretched the sheets are a little resinous."

Notes and Comments by the Scientific Officer.

136. *Acacia decurrens.*—A correspondent writes that he has got *Acacia decurrens* planted in rows in his Tea for mulching purposes. He remarks that they are very little use for this purpose and that he is doubtful whether they supply much Nitrogen to the soil. He now finds that their roots grow luxuriantly in the supply pits eight or ten feet away from the stem. He concludes, "I am afraid they will check the growth of the young supplies and absorb the nourishment and moisture. They have been planted some three or four years now and I do not observe that the older Tea plants are any the better for them. I feel inclined to cut them down, and my neighbours are of the same opinion."

Acacia decurrens has not proved altogether a success in Tea in Southern India. It must be understood that unless it is topped and the toppings used as a mulch it cannot supply Nitrogen to the soil. The leaves and young shoots of Leguminous plants contain a higher percentage of Nitrogen than those of other plants, which Nitrogen is obtained chiefly from the air in the soil by means of special Bacteria in the nodules to be found on the roots. It is only when these roots and branches are returned to the soil as a mulch, or by burying, that tnis Nitrogen is set free for the use of the Tea.

If the roots are interfering with the Tea, they should be cut. The best plan is to cut through all the roots which can be got at on one side of each tree down the lines close to the stem. The roots on the other side can be cut in a similar way the following year. When this is done the portions of root cut off die and the Nitrogen in the nodules is set free. The neighbouring Tea benefits from this and also is relieved from the competition of the *Acacia* roots and as a rule the improvement is most marked. This process can be repeated from time to time as well as topping and is much preferable to cutting down the trees altogether. In the latter case the stumps are a danger, as they almost always start Stump Rot and kill the surrounding Tea. If the *Acacia* is cut down and killed, the stumps must be removed to a depth of at least two feet and the holes limed.

137. *Loss of Lime from the Soil*—In continuation of Note No. 115, a recent number of the Experiment Station Record (U. S. A. Department of Agriculture) contains an account of the researches of a German Chemist, Mr. Gerlach, on field drainage systems, and his results show "that phosphoric acid is firmly fixed in the soil and is subject to little or no loss in the drainage. The largest loss is in the case of lime. Potash is also removed in the drainage to a considerable extent. The loss of nitrogen is smaller than that of either lime or potash, and mostly in the form of nitric nitrogen."

"Examinations of a number of soils show that the surface soil is as a rule richer in nitrogen and phosphoric acid than the subsoil. On the other hand, the subsoils usually contain more lime and potash than the surface soil."

RUDOLPH D. ANSTEAD,
Planting Expert.

In the Congo State Government Coffee plantations Liberian is being replaced by the indigenous *Coffea robusta*, which grows luxuriantly at Sankura. *Coffea robusta* flourishes also in the Dutch East Indies, and is being tried in South India.

DISTRICT PLANTERS' ASSOCIATIONS.

North Mysore Planters' Association.

Proceedings of the Quarterly General Meeting held at Balehonnur on October 9, 1911.

PRESENT.—Messrs. C. P. Reed (President,) C. Danvers, C. S. Crawford, C. H. Browne, F. W. Hight, E. H. Young and A. F. Evetts, (Honorary Secretary)

By Proxy.—Messrs. T. Hunt, E, Lund, S. L. Mathias and D. Mathias.

Visitors.—Messrs. N. G. B. Kirwan and Rev. J. Redmond.

Delegate's Report U. P. A. Meeting.—Mr. Danvers addressed the meeting at some length as to what took place at the meeting in Bangalore.

A hearty vote of thanks was accorded to Mr. Danvers for so ably representing this Association.

Experimental Plot Subscription.—The Hon. Secretary was authorised to pay the sum guaranteed.

Sectional Meetings.—Read Circular No. 61/11 from the Secretary, U. P. A. S. I.

Annual Subscription (N. M. P. A.)—Resolved: That as funds in connection with the Assistant Scientific Officer will not be required until January 1st 1912, subscriptions for 1911 be raised on the old basis.

The Scientific Officer.—Read Circular No. 63/11 from Secretary, U. P. A. S. I.

This Association has no objection to Mr. Anstead serving on the proposed Government Committee to consider measures to guard against the introduction of insect pests and fungoid diseases.

Dasara Delegate.—The list of subjects handed to our Delegate, Mr. Pilkington, for representation at the Dasara Assembly were read out.

Labour Difficulties.—Letters from Messrs. Hunt and Lund were read.

After some discussion a proposal by Mr. Pilkington, seconded by Mr. Foster, was adopted—"That this meeting do appoint a small Committee to consider the best means of retaining our labour."

The following were elected to serve on the Committee:—Messrs. Parton, Bolton, S. L. Mathias, Browne, Lund, Danvers, Hunt, Crawford, Reed, Evetts and Hight.

Local Labour Rules.—Resolved:—That in view of the alarming increase of crimping observed this season and with the object of checking it in the future, it is advisable to have a short set of local rules for the guidance of planters and labour recruiters, and that the Hon. Secretary be instructed to circulate copies of the rules now current in Travancore as a guide to framing our own rules at the next meeting. It is hoped that members will give the subject their earnest attention.

Mr. Martin's Labour Advertisement.—Mr. Martin's letter and circular were read. It was decided to pass the matter on to the 'Labour Difficulties' Committee for consideration.

Tea Cultivation in North Mysore.—Read letter from Mr. Anstead, dated 3/7/11 on the subject.

Kalasa Telegraph Office.—Read letter from Director of Telegraphs, Madras Circle, dated September 2, 1911.

Sanderson Memorial Ward.—Read letter from the Deputy Commissioner, Kolar District, dated 1st September 1911 and enclosure.

The Hon. Secretary was directed to circulate a subscription list.

Coffee Stealing.—Read correspondence on the above. The Hon. Secretary was directed to request Mr. Kent to furnish a history of the case with a copy of the judgment.

(Signed) A. F. EVETTS, *Hon. Secretary.*

RUBBER.

Latex and its Relation to the Life of the Parent Plant.

An article contributed by Mr. Keith Bancroft, B.A., to the *Agricultural Bulletin of the Straits and Federated Malay States* reads as follows :—

There are present in many plants chemical substances which, although recognised as products of activity of the living cell, neither in their exact mode of formation nor in their full significance are clearly understood. Among such substances are the alkaloids, glucosides, colouring matters, ethereal oils, resins and caoutchouc or India rubber. Many of these products are of some considerable economic importance. The alkaloids include strychnine, quinine, morphine and other drugs and violent poisons. Of the glucosides, which are compounds of sugars with various substances, some too are poisonous, yielding on decomposition prussic acid. The Lima bean or Java bean contains such a glucoside ; and when it is growing wild the percentage of prussic acid in the stems and leaves may be sufficiently high to be fatal to animals which feed on it. There is good reason to believe that such a glucoside occurs in the shoots of the Pará rubber ; and an example of its poisonous properties occurred several years ago, when some Pará rubber trees growing in the garden of the Residency in Taiping were felled because they had proved poisonous to horses.

The presence of such poisonous substances in plants serves no doubt to check the ravages of animals ; but this can scarcely be regarded as a primary function.

The colouring matters in plants serve to attract insects, whose association with plants is frequently beneficial.

The ethereal oils and resins are recognised as products of excretion. But the significance of the relation of these bodies to the economy of the parent is not clear.

The significance of the presence of caoutchouc in plants is, perhaps, still less clearly understood. Caoutchouc occurs in the latex of plants of different natural orders, among which are the *Euphorbiaceae*, including *Manihot* Ceará, and *Hevea* Pará rubber, the *Urticaceae*, containing *Ficus*, *Rambong*, and *Castilloa*, and the *Apocynaceae* of which *Willughbeia* and *Leuconotis*, Borneo rubbers, are members, along with the various natural orders which contain numerous species yielding so-called "gutta-percha." Latex is the name given to a fluid which is either watery or viscous, colourless, white, yellow, orange or red, and is contained in specialised cells, called latex tubes. The cow tree of Venezuela (*Galactodendron utile*) yields a sweet milk of good flavour ; the dried latex of the Poppy (*Papaver somniferum*) is the opium of commerce ; the milky Agarics, fungi of the mushroom type, yield white, orange or red latex ; and many other species occur which are of interest or of economic importance.

Latex is an emulsion of various substances is a water-basis ; these are resins, caoutchouc of different kinds, oils, tannins, proteids, sugars, starch, alkaloids, ferments and salts. The tubes in which the latex occurs are divided into two classes according to their mode of origin, *viz*., laticiferous vessels and laticiferous cells. The former arise by the fusion of independent cells, this class including *Manihot* and *Hevea*, while the latter originate by the growth of special cells which are said by some to be differentiated in the undeveloped embryo of the seed. These tubes, when fully formed, are living cells connected by branches and frequently forming a close network ; they occur in all parts of the plant.

The tubes, when present, are associated in the stems and leaves of plants with those special tissues to which the function of conducting plastic food material is ascribed. And this close association, coupled with the richness of the latex in food substances, such as proteid, starch and sugar, suggests at once that the latex tubes function as a conducting system by means of which food material is conveyed from one part of the plant to another. There is other evidence in support of this suggestion. For example where latex tubes occur, those particular tissues which are normally concerned with the conduction of so-called elaborated food-material are deficient and are frequently badly developed. Again, in *Euphorbia*, as the young plant commences to develop in the seed the latex becomes poorer; when it has germinated the grows richer. And abnormal conditions which stop certain of the life process, notably that of *assimilation* make the latex poor.

Assuming, then, that the tubes serve to conduct food-material in the plant, the question arises "Is the latex actually in circulation in the plant?" That it is so there is no doubt, since Schwendener has actually seen it in transparent seedlings of *Chelidonium*.

From this evidence we conclude that latex bears some actual relation to the economy of the parent, and this relation must be the conduction of plastic food-material. When, by some interference with the normal life-processes of the plant, the latex becomes poor on the resumption of the normal condition it becomes again rich, and the richness in food-material has been found to commence in the leaves and to extend to the roots. We can have no stronger corroborative evidence than this of the supposition that the latex tubes are a path by which food-material is conveyed in the plant. We, therefore, conclude in the light of modern conception of the nutrition of plants that the laticiferous system in plants serves the purpose of conducting plastic food material.

In addition, however, to containing food substances the latex contains bodies which are regarded as "excretory substances." The plant has no means by which it can excrete its useless products outwardly; and the excretory substances are stored in different parts of the plant body. Such substances are regarded as "end-products" in the metabolism of the cell and are incapable on being utilised for purposes of nutrition. The resins, gum-resins and gum-mucilages are recognised as excretory products. Such substances are known to occur in latex; the latex tubes are, therefore, regarded as serving the function of excretion. The caoutchouc in all probability does not exist as such in the latex, but is produced during coagulation from simpler bodies similarly constituted chemically. It is itself a compound of carbon and hydrogen and is chemically comparatively inactive. There is, therefore, some probability that it is an end-product and incapable of being further utilised by the parent. Much more requires to be learnt, however, concerning the changes which occur in latex in different parts of the plant and under different conditions, before any accurate conclusions can be arrived at as to the significance of the presence of caoutchouc.

Enzymes have been demonstrated in the latex of some plants. *Ficus Carica* and *Carica papaya* (papaw) contain peptonising enzymes. The presence of an oxidase has been demonstrated in the latex of *Hevea* the occurence of black latex is ascribed this enzyme. The presence of enzymes is significant of the occurence of active changes in the latex.

In addition to the above mentioned functions of latex two others occur, *viz.*, the sealing of wounds and the protection of the plants from

animals. Latex containing caoutchouc coagulates quickly, and the coagulated mass serves to seal wounds more or less effectively. In some plants the latex tubes branch close to the surface and thus facilitate the sealing of wounds by the juice. In other plants hairs containing latex are present on the floral bracts and are thus regarded as serving to protect the flowers from animals, while the occurrence of poisonous substances in latex is no doubt an efficient means of protection against certain animals. It is not uncommon to find insects in the neighbourhood of *Hevea* plantations bearing masses of coagulated latex on all parts of their bodies in such quantity as to considerably hinder their movement; and it is believed that the insects pests of *Hevea* would cause considerably greater damage, were it not for the protection offered by the latex.

The occurrence of these two functions of latex is clear; but they in all probability are primary functions and can only be regarded as incidental. With regard to the two first named functions, the one of conducting food material and the other of receiving products of excretion, it is uncertain as to which was the primary one.

The relation of latex to the life of the parent possesses far more than a mere scientific interest. The recognition of the laticiferous tubes as a means of conducting plastic food material is of itself of primary importance, inasmuch as such problems of practical importance as tapping, systems of tapping, bark renewal, etc., are closely connected with it, while an accurate knowledge of the significance and mode of formation of caoutchouc must be of considerable value to the practical cultivator.

Dr. Pahl's Discovery.

A correspondent writes to *The Rubber World*:—

Discovery and progress are the order of the day where rubber is concerned. It must be so, for rubber is only at the beginning of its possibilities. At the recent Exhibition was shown the "Rapid Coagulator" invented by Dr. Wilhelm Pahl, the well-known manufacturer and chemist of Dortmund. That invention, only one of many, Mr. H. S. Smith's and Mr. Wicherley's among them, may spell revolution in the treatment of plantation latex. During a journey which he took to India and Sumatra to study rubber, Dr. Pahl discovered an agent which he believes will alone place plantation rubber on a level with real Pará; that agent is carbonic acid. With the assistance of Dr. Heinzerling, he has investigated the profitable and noxious influences of the usual admixtures with rubber and guttapercha, more especially with reference to the qualities necessary in the technical employment of both. The result has been purchased by the Prussian Federation for the Encouragement of Industry, and will be published in due time.

Dr. Pahl's view was that acetic acid, sulphuric acid, hydrofluoric acid, all failed to give Pará rubber, and he believes that carbonic acid is the sole agent for securing the real thing. The advantages claimed for carbonic acid are:—

1. The latex is coagulated instantly.

2. The latex is an emulsion of fluid rubber particles in conjunction with vegetable albumen. The reaction of carbonic acid on this albuminous vegetable substance is so efficacious that the different rubber particles unite in a way which secures an exceedingly strong polymerization.

3. Rubber obtained by carbonic acid is the more valuable because the salts contained in the latex are precipitated to carbonates.

4. Coagulation by carbonic acid is the cleanest and gives the cleanest and lightest coloured rubber.

5. The rubber so obtained never becomes mouldy, as carbonic acid is an antiseptic; it can neither oxidise nor decay.

6. Carbonic acid renders feasible for the first time, in the coagulation of Plantation Rubber, the use of agas; the carbonic acid disappears when the rubber is worked; acids employed hitherto remain in part enclosed in the rubber and are prejudicial to manufactured goods.

7. The employment of carbonic acid is simple and can be entrusted to anybody; there is no weighting, no thinning, as is the case when acetic acid is used; natives may use as much carbonic acid as they like without harm to the produce.

8. Carbonic acid is the cheapest agent of coagulation.

9. It renders possible for the first time the reduction of the latex to dust, thus ensuring contact with the smallest particles.

The invention and all apparatus belonging to it has been patented in all countries. Trials made in Africa and India have been quite successful, and everyone interested in the rubber industry will look forward to the fuller details of Dr. Pahl's discovery which are promised.

In Brazil.

At Rio de Janeiro, on the 14th August, the Minister of Agriculture presided at a meeting of the Congress of those interested in the solution of the rubber difficulties. In the course of his speech, Dr. Toledo remarked that the Northern States of the Union depend for their existence on the production of rubber, of which the principal varieties are seringa and caucho, growing wild in the Amazon valley; Maniçoba, indigenous to the right bank of the River Parahyba and the North of the State of Minas Geraes, and Mangabeira, found from Maranhao to S. Paulo, in Goyaz, Minas Geraes, and Matto Grasso and also in certain regions in Pará and Amazonas.

The first-mentioned varieties are practically all wild, and very little planting has so far been attempted. Maniçoba and Mangabeira, however, are now being planted.

The seringa rubber in the Amazon valley would be sufficient by itself to supply the growing needs of the world's consumption if it could be worked economically, which is only possible with a far greater population than that at present available, and better means of transport. At present, except in the Acre, seringa rubber has practically only been touched to a distance of about 10 kilometres on each side of rivers navigable to some sort of craft.

With regard to cauoho, which also exists in the Amazon valley, the tree has to be cut down to obtain the rubber, and the result is that on the banks of the rivers the country has been devastated, so that with increasing distance to carry the rubber expenses have increased.

Maniçoba rubber is at present collected at a cost much more favourable to its sale than is seringa, mainly owing to the fact that its production has been to a certain extent systematised.

Mangabeira rubber has been gathered at the expense of many trees, owing to the brutal treatment they have received at the hands of the tappers.

During the last five years the total exports from Brazil gave 939'410 : 449$, of which 385'493 : 560$ from coffee and 376'971 : 830$ from rubber, so that on an average for that period, coffee gave 42'31 per cent. of total exports and rubber 36'09 per cent.

Suggestions for Dealing with Eastern Competition.

The Minister then proceeded to deal with competition from the East, showing that it is expected that within five or six years, rubber produced there will reach 75,000 tons, or double the actual production of Brazil. In addition to this, the rubber of the East can be produced at half the cost of the Brazilian article.

To combat this competition, the Minister says that transport must be improved and reduced in cost, aid must be given to labourers, agricultural centres must be established, the actual article itself improved, and the various rubbers planted on a large scale in the districts most suited to their cultivation.

The rubber which the Minister considers should be chiefly pushed is Maniçoba, as it can be cultivated more cheaply and with advantage almost the whole way from Amazonas to Parana, and if aided by the Federal and State Governments should in ten or fifteen years give a revenue equal to that of coffee.

Seringa and Mangabeira should also be helped, but caucho, the Minister thinks, should be left to its own devices, as it has got into the hands of unscrupulous adventurers, and as the tree takes eight years to grow and then has to be cut down to give its rubber, it is not worth cultivating.

The problem of the rubber is a national one, and in conjunction with the President of the Republic, the Minister proposed the following measures of a general character:

Exemption from duties for implements and tools used in the production of seringa, manicoba, and mangabeira. Money prizes to be given for supplementary cultivation of the said three varieties; establishment of experimental stations and farms for the cultivation of seringa in the North, Maniçoba in the North and Centre, and Mangabeira in the Centre and further South; a gradual reduction up to 50% of the present Federal State and Municipal export taxes on seringa, Maniçoba and Mangabeira, but not on caucho, and the removal of the tax altogether for a period of twenty-five years on all rubber produced from cultivated trees, caucho excepted; grants in aid for the establishment of refineries for the reducing of each kind of rubber to a uniform type for export; grants for the establishment of factories for the making of rubber goods, principally at Manaos, Balem, Recife, Bahia and Rio de Janeiro; organisation of a special navigation service for persons anxious to work in rubber States.

In order to aid the production of seringa, special measures are to be taken for the construction of railways, clearing of rivers, removal of import taxes on vessels bought to ply on the rivers and granting of special favours to any company which will establish coal depôts at convenient points on the rivers for the supply of the ships.

Further, the two National estates of Rio Branco shall be leased to a company for the breeding of cattle, growing of wheat and other cereals, and the supply generally of articles of food. Government will itself settle immigrants on the S. Marcos estate, and produce similar articles there, and also breed horses and mules. Favours will be granted to three companies undertaking to run large estates on the same lines in the Acre Territory, State of Amazonas, and State of Pará. Favours will be granted to a company undertaking the finishing industry and the salting and preserving of fish.

Titles to land in the Acre Territory will be proved at once. Finally, triennial Exhibitions will be held at Rio de Janeiro.

SOILS AND FERTILISERS.

The Application of Lime in Agricultural Practice, with particular reference to Para Rubber Trees.

Mr. B. J. Eaton, F.I.C., F.C.S., Agricultural Chemist, F.M.S., writes to the *Agricultural Bulletin of the Straits and F. M. States* :—

Considerable interest is now being taken by planters in the Federated Malay States in the subject of manuring, and requests for soil analysis and advice re manuring are being constantly received by the Department of Agriculture, F. M. S.

A number of enquiries has been received asking particularly for advice re lime, its method of application, and the benefits to be derived from it, in consequence of which it has been thought advisable to publish this article, which although it makes no claim to originality, it is hoped will explain the value of lime as a factor in agriculture.

Soils of the Federated Malay States.—

In general it may be stated that soils in this country are deficient in essential mineral constituents, *viz.*, lime, phosphates and potash, and as a rule contain fairly large quantities of nitrogen, especially where the land has previously been under virgin jungle.

The deficiency in lime or calcium salts is particularly marked and is greatest in the peat formations of the coast overlying clay subsoils.

As is well-known, the peaty soils are very sour or acid in character when first opened out and the drainage water remains acid for months or even years after such lands are first opened out for cultivation.

The Advantages of Liming.—

(*a*) *Peaty Lands* :—In earlier days of agricultural practice in Europe, peaty lands were first opened out by thorough drainage, to carry off the excess of water and to aerate and dry the soils.

The surface was then broken up by ploughs and the earth heaped together and burnt, the combustion being allowed to proceed slowly. In this way the mineral constituents were increased proportionately and the acidity of the soil was neutralised by the alkaline ashes—chiefly carbonates of the alkalis (soda and potash) formed by burning the organic salts of these substances.

The great disadvantage of such a process is the loss of nitrogen in the organic matter of the soil.

This method has now been replaced by thorough drainage of land in such cases, the land after drainage being allowed to remain for some considerable time, in order to become consolidated, since as is well known, and can be easily observed in the peaty soils in our coast districts, considerable shrinkage takes place when such land is opened out, and the land frequently sinks a foot or even more in many cases. The soil is then thoroughly limed to neutralise any acidity and to render the essential constituents more available for the plants subsequently cultivated on the land. To show the effect of lime on peaty land it is only necessary to collect the dark brown peaty drainage water and add to it a little lime water or solid lime—when, on standing for about 5-10 minutes, the whole of the organic matter is precipitated and a clear colourless water left.

(*b*) *Clay Lands.*—Clay soils were originally improved in a similar way, the clay after ploughing being heaped together with organic

debris and slowly burnt at a low temperature. The physical texture of clay soils is improved in this way. The same disadvantage in the application of this method to clay soils exists as in the case of peaty soils, *i.e.*, loss of organic nitrogen.

In addition to the advantages of improved physical texture in both cases, there is no doubt, in the light of recent discoveries, that the well-known effect of this burning was partly due to the partial sterilization of the soils which subsequently increased the bacterial flora.

This no doubt occurs to a considerable extent when virgin jungle is felled and burnt in countries such as the Federated Malay States, as, although, probably in some parts the beneficial and other bacteria are completely killed by the high temperature on the surface, the temperature at the depth of say one foot would be only sufficient to partially sterilize the soils and thus give rise to the benefits of such a process. Clay soils are improved to a remarkable extent by liming—the effect being principally an improvement of the texture of the soil.

The finer soil particles are coalesced by the addition of lime and lime salts and become flocculated into large particles, so that such soils after treatment become more open in texture and retain less water, which is often a desideratum in this country particularly in flat lowlying lands.

(A simple experiment can be easily carried out to demonstrate this flocculating effect of lime on collodial clay particles. Two tall glass cylinders are taken and in a separate vessel a mixture of clay and water is made. The supernatant liquid from this mixture is then decanted into the two cylinders—the liquid contains only the finest clay particles which remain suspended in the water, for the most part for an indefinite length of time. If a trace of lime, slaked or quicklime or a solution of lime water be added to one of the cylinders, the whole of the clay particles suspended in the cylinder will quickly fall as a sediment to the bottom of the liquid above. This experiment is simple and elementary but very instructive.)

Clay soils after treatment with lime are more easily cultivated and do not crack or cake when dry,

(c) *Sandy soils*:—Although it may appear somewhat paradoxical, lime has also a beneficial action on light sandy soils, rendering them more cohesive by cementing the loose particles together.

This is easily understood when we consider the use of lime as binding agent in the preparation of mortar.

General Effects of Lime.—

The general effects of the application of lime can be conveniently classified as follows:—

1. Mechanical or Physical.
2. Chemical.
3. Biological.

The chemical and biological effect of the action of lime on soils are closely connected, since the biological effects are productive of changes in the chemical compounds present in the soil.

These effects are general, to a greater or less extent, for all types of soil.

1. *Mechanical effects of lime on soils.*—The first of these has been sufficiently dealt with above in discussing the application of lime to peaty, clayey and light sandy soils.

2. *Chemical effect of lime on soils.*—Lime acts directly as a plant food, some plants requiring comparatively large quantities;—one of its principal functions appears to be to strengthen the woody portions of trees.

The effect, however, of lime as a direct plant food is of minor importance as compared with its indirect action on soils, due to its action as a base.

It acts indirectly by rendering available the dormant fertility of all soils. It liberates potash from the insoluble silicates with which it is combined. Quicklime or slaked lime is preferable to lime stone for this purpose. It also assists the decomposition of organic nitrogenous matter, when not present in excessive quantity, and is thus especially beneficial in this respect on peaty soils.

It corrects soil acidity, which is generally harmful to vegetation. Many coarse grasses, sedges and other weeds which only flourish on acid soils disappear after the application of lime.

It also renders phosphoric acid available by liberating it from its combination with iron and alumina, with which phosphoric acid must be usually combined in the laterite soils in this country.

It is also essential after the application of repeated dressings of other manures such as Ammonium sulphate, Kainit and Superphosphates, the accumulated effects of which are to produce acidity. Thus in general the application of artificial manures necessitates a corresponding increase in the application of lime.

Biological effects of Lime.—The biological effects of lime on soils, as stated before, are intimately connected with the chemical effects.

It is essential to the successful action of nitrifying bacteria to combine with the nitric acid produced by these bacteria. It generally assists other fermentative actions in the soil, since those which are of benefit only occur in the presence of some base such as lime, whereas deleterious fermentation changes occur in sour soils in which nitrogen is actually liberated and escapes into the atmosphere.

Another important function is its inimical action on a number of fungoid root diseases, the particular instance in connection with the cultivation of Pará rubber trees being its action on *Fomes semitostus*.

Compounds of Lime.—It must be remembered that the benefits to be derived from liming so called are almost entirely dependent on its value as a base and not because of the calcium it contains as a direct plant food, so that it must be applied in one of the following forms, quicklime, slaked lime, or chalk (or other forms of carbonate such as limestone.)

Whether applied as quicklime or slaked lime, which are both oxides of calcium or "lime," it is converted eventually into carbonate by the carbonic acid present in the atmosphere or the soil.

The application of lime in the form of chalk (a soft lime stone) so common in many parts of England, is probably known to most planters in this country. There are, however, no deposits of this nature in the Malayan Peninsula. It is preferable, however, to apply lime in the form of quicklime or slaked lime rather than as chalk or lime stone as, although eventually the lime is carbonated in the soil, the particles of quicklime or slaked lime are much finer than either chalk or lime stone, can be reduced by grinding, and are thus more readily incorporated in, and absorbed by the soil.

Methods of Application.—

If quicklime is employed as a dressing it should first be heaped and slaked with water and allowed to fall to a dry powder—" Slaked lime," as if quicklime is spread broadcast over the soil, it tends to form lumps and is not easily converted into a powder.

If " Slaked lime" is used, it can be immediately spread over the surface of the soil.

" Ground Lime" which in the end is more economical cannot be obtained in this country (unless perhaps at the marble works at Ipoh, Perak, F.M.S.)

With trees under two years old, the preferable method would be to dig shallow circular trenches with a radius of about two feet round each tree, and apply to each tree individually.

On older clearings where the roots of trees interlace, it would be more economical and equally effective to broadcast the lime, and fork over the whole surface of the area treated.

An application of at least 5 cwt. per acre should be used, or four times the quantity on peat soils and on heavy clay soils. A second application of 5 cwt. might be applied in the subsequent year.

General Remarks.—It should be borne in mind that all manurial treatment of this kind should be carefully checked in order to ascertain whether the effects produced are sufficient to warrant the expense incurred.

It is useless, as some planters and even some supposed trained investigators do, to carry out field experiments of this or any other kind without checking the effects on a sufficiently large area, at least 100 trees should be kept as a control, adjoining the area treated, and these together with at least 100 trees that have been " limed," or manured as the case may be, should be measured before treatment and subsequently, and if tapping has commenced, the dry rubber yield should be checked in each case over a long period.

The effect of " liming " is unlikely to be felt within six months or even a year, even in a hot humid climate such as this ; more especially is this the case, when lime is applied during such a drought as has recently been experienced. It is preferable, however, to apply lime and other manures in this country of copious rainfall, during a comparatively dry season.

Lime is not a very soluble manure, and its action is consequently slow.

Tea and Coffee Consumption.

A recent Board of Trade return on the consumption of tea and coffee shows that the amount of tea imported and retained for home consumption in the United Kingdom last year was 286,892,000 lbs., giving a consumption per head of the population of 6·39 lbs., against 283,330,000 lbs., and 6·37 lbs. respectively in 1909. The figures for certain countries last year cannot be stated, but the next highest percentage to the United Kingdom per head of the population was Canada, 4·34 lbs. per head ; the Netherlands, 2·07 lbs. ; Russia, 0·90 lb. ; and the United States of America, 0·89 lb. The chief tea-consuming countries per head of the population apart from Great Britain in 1909 were :—Commonwealth of Australia, 6·83 lbs. ; New Zealand, 7·45 lbs. ; and Canada 4·43 lbs. In regard to coffee, however, a very different tale has to be told. In the United Kingdom last year the consumption of coffee per head of the population was 0·65 lb., the lowest, so far as could be stated, in those countries making returns. The Netherlands were highest with 15·12 lbs.; next came Belgium, with 10·90 lbs., and the United States, with 9·33 lbs., while France followed with 6·26 lbs., and Germany with 5·80 lbs.

SELECTED CUTTINGS.

British Association.

ADDRESS TO AGRICULTURAL SUB-SECTION.

The address by the Chairman of the Sub-section, Mr. W. Bateson, F.R.S., to the Agricultural sub-section must have been listened to with interest by all serious students of Agriculture and allied arts.

Mr. Bateson began his address by pointing out that, with the institution of the Development Grant, a national subsidy was provided on a considerable scale in England for the first time, and that the conditions under which it might most successfully be applied were matters for careful consideration. Other nations had made enormous efforts in this direction, and we had their experience to guide us. While fully appreciating the valuable results that had already been obtained wherever agricultural science had been properly organised, he could not help asking whether the whole outcome might not have been greater still. The supposed necessity for satisfying a public opinion, which demanded rapid returns for outlay and preferred immediate apparent results, however trivial, to the long delay which is the almost inevitable accompaniment of any serious production, was responsible for much. It could not be too widely known that in all sciences, research is nearly always a very slow process. If this is true for new industries, chemical and electrical, for instance, still more is it the case in an ancient art like agriculture.

An applicable science must be created before it could be applied. It was with the discovery and development of such science that agricultural research would for a long time best occupy its energies. To tell a man that he must not pursue an enquiry further because he could not foresee an immediate application of the knowledge he would acquire was almost always a course detrimental to the real interests of the applied science.

In this country where the Development Commission would be for many years presumably the main controller of agricultural research, the institution of the Advisory Board formed a guarantee that broader counsels would prevail; and it was to be hoped that the future administration of this work would be guided in the same spirit.

We should beware of giving false hopes. Why not take the farmer and gardener into our confidence and tell them that in these things science was only approaching the experimental stage? To affect otherwise would be unworthy of the dignity of the science. So only would the confidence of the laity be assured towards research. In spite of the imposing results already obtained by breeders, he found almost all had some ideal not yet attained: that they were looking to scientific research to help them obtain results with greater ease and certainty. In certain selected cases science was able to help these enquirers, and if the practical man and the science student could combine their respective experiences, he believed that these cases would be found to be very numerous.

The modes by which combinations could be made and new forms fixed were, through the recent developments of genetic science, now reasonably clear; and with that knowledge much of the breeders' work was simplified.

One of the interesting examples Mr. Bateson mentioned was Mr. H. M. Leake's work on the "Cotton of India." The cottons of fine quality grown in India are late in flowering. In the United Provinces a comparatively early flowering form is required. Hitherto, no early form of high quality has

existed, but Mr. Leake has now made the combination needed. It is safe to say that this practical achievement could not have been made with such rapidity and certainty until the development of genetic physiology by Mendelian analysis.

One of the greatest advances claimed for this work was that it should induce raisers of seed crops to take more hopeful views regarding their absolute purification than has hitherto prevailed. It is at present accepted as part of the natural perversity of things that most high-class seed must throw "rogues." This view may be correct, but more probably we should regard these rogues either as a product of a few definite individuals, or as chance impurities. In either case they can presumably be got rid of.

The "bolting" of crops grown as biennials, especially root crops, was referred to as another important class of cases to which similar considerations apply.

Whether the loss due to these causes would prove preventable or not, one thing was certain : we had now the power to formulate rightly the question which the breeder was to put to nature, and the method by which he could obtain an answer to his question, in whatever sense that answer might be given.

Yet had Mendel's eight years' work been done at an Agricultural School, supported by public money, one could imagine much shaking of heads on the county council governing that institution at investigations of the seemingly barren problem, "What is a species ?"

Another line of research Mr. Bateson thought likely to lead to economic results was an investigation of the nature of variation in size of an organism or its parts.

What, again, he enquired, was the cause of self-sterility ? American experimenters were, no doubt, right in attributing the failure of large plantations of a single variety of Apple or Pear in a high degree to this cause.

"And what was the meaning of the wonderful increase in size or in "yield," which so often followed a first cross ? This fact had been made use of in breeeding stock and raising table poultry. It has been suggested by Mr. G. N. Collins, of the U. S. Department of Agriculture, that it might be applied in the case of Maize. The cross is easy to make on a commercial scale, and the increase ranges as high as 95 per cent. Mr. Bateson believed that, to understand the meaning of this phenomena would be an addition to human knowledge of very great significance.

In the application of science to agriculture, chemistry very properly and inevitably had come first, while breeding had remained under the control of common sense alone. Much, however, as the student of the conditions of life had done and could do for agriculture, the breeder could do more. If one had a Wheat of poor yield, no amount of attention to cultivation or manuring would give a good crop. An animal that was a bad doer would remain so in the finest pasture.

In conclusion, the lecturer said he wished to sound the same note with which he began : if we were to progress fast, there must be no separation between pure and applied science. The practical man and the science student had everything to gain from free interchange of experience and ideas. —*The Gardeners' Chronicle.*

The Planters' Chronicle.

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(INCORPORATED.)

The Scientific Officer.

Mr. R. D. Anstead, B. A., returned from Mercara on the evening of the 22nd instant.

Mysore Exhibition, 1911.

A very effective display of the planting products of Southern India was made at the Mysore Dasara Industrial and Agricultural Exhibition held at Mysore from September 30 to October 17, 1911.

Reference has been made already to the Awards conferred on the Association and some of the individual exhibitors.

Mr. R. D. Anstead, B.A., took charge of the arrangemets, and worked hard to assure the success that was eventually achieved. A portion of the special room allotted to the Planters' Section was made over to Messrs. Spencer & Co., Ltd., for the purposes of a Tea and Coffee Room. This firm deserves the warm thanks of the Association for the care with which every detail was attended to. Well arranged and ably managed, the Tea and Coffee Room deserved much more liberal patronage than it received; and Mr. A. T. Selby, who was in charge, had at least the satisfaction of hearing those who partook of the Tea and Coffee prepared under his care praise very highly the infusions served out to them. "The best we have tasted in India" may almost be said to have become a common form of expression; and if "the cheapest" had been added the remark would have been just as true, for both Tea and Coffee were supplied at the low price of 1 anna per cup. It must be acknowledged that the attendance of Hindus and Mahomedans was poor; but those who decided to try the tea or coffee proved quite as appreciative as the European consumers did.

A few sales of Coffee, in tins, resulted; and a special inquiry was made by a high Mysore official as to why such high-class Mysore Coffee was not obtainable in the berry, from the various retailers in Bangalore and elsewhere. This inquiry may lead to regular business at a later date. As regards Tea, there was a demand for packets, but no supply. Still, the lines were laid for some orders, and these should open the way for more.

The Planters' Section, like that of the Forestry Department and of the Mysore Agricultural Department was, in fact, more in the nature of a demonstration of what is grown in South India by European planters, than an advertisement designed to increase sales. This must always be the case to a large extent, since the majority of the products are grown for the European markets and local sales are neither sought for nor desired. Should it be decided to take part in any future exhibitions, those who are desirous of working up local sales for their produce should send an exhibit

specially designed to advertise that point, with price lists for distribution, and a stock of samples actually for sale. It was difficult to make many people understand that the exhibits were not for sale like those of other exhibitors, and the tendency was to ask why Coffee, Tea, etc, were exhibited which could not be bought.

The display of Coffee showed not only the various grades, but uncured and unpounded cherry, and this proved a most popular exhibit, especially for the many who were not familiar with Coffee on the estate. Taken as a whole, the Coffee exhibits were excellent, and special mention must be made of the extensive display of both raw and tinned coffees made by Messrs. Matheson & Co., Ltd., of Hunsur. Mr. F. M. Hamilton's "Golden Drop" and the various Hybrids on show attracted a good deal of attention ; and Mysore planters in particular will be glad to learn that at this Mysore Exhibition their products, those of the State itself, were very conspicuous.

One of the visitors wished to see a sample of *Mocha* coffee, and expressed surprise when informed that none was available ; but he was informed that the Section was intended to display *South Indian products only*, and this satisfied him.

Mysore was responsible for all the samples of Cardamoms exhibited except one, and the Bleached Cardamoms shown by Mr. W. L. Crawford were very much admired. It was a good display and a popular one, and it suffered for its excellence at the hands of samplers. Mysore, again, put up a fine show of Pepper both Black and White.

Of Tea there were some good ranges of samples from Malabar and Travancore, and it was unfortunate that there was no sales branch to back this up.

As regards Rubber, the one regrettable feature was the almost entire absence of exhibits of the products of the Mysore State. Travancore, Cochin and the Shevaroys made up for this, as far as was possible ; and the Rubber display was, in its entirety, the finest that has yet been made in India. Still, the visitors were very largely Mysoreans, and it was a disappointment to some of the leaders among them when they learnt how poorly the Mysore product was represented. It is to be feared, indeed, that an excellent opportunity of impressing Mysore officials with the capabilities of their State as a producer of Ceará rubber was missed, because of the want of exhibits showing the best that has yet been done in this direction.

A very complete and representative display of the whole industry was shown, ranging from Seed and Seed Products, Plants and Stumps, to every grade of the finished product. Specimens of tapping knives, latex collecting cups and coagulating dishes were also shown. In the Hevea Section, the Periyar Rubber Co., Ltd., had a fine display of big samples showing all grades of Crepe, and this exhibit came in for more admiration and elicited more curiosity than any other. Venture Estate had a beautiful exhibit of Hevea Biscuits, some of the finest, probably, ever shown, and when once visitors, especially those of the fair sex, had recovered from their disappointment at finding that they were not "popadums," they were much admired. Periyar exhibited a series of Stumps illustrating how these should be cut and prepared for packing and, what was more valuable still, how they should not. The same estate also showed a most instructive series of Hevea Seeds, again showing in the clearest way what should be bought and what should not, and incidentally the way in which they are selected at the estate. In fact the most warm thanks of the Association are due to Mr. H. B. Kirk for the trouble he took and the keen interest he showed in this exhibition. It is series of exhibits such as he

sent in, which not only show the public a finished product, but at the same time show how it is obtained and the various grades of it, and the by-products incidental to it, which are needed and which prove most popular at all Exhibitions.

In the Ceará Section the best and most interesting exhibit was a series of hand-made sheet shown by Mr. L. E. T. Short, from Maryland Estate, Shevaroys. Mr. Short also sent an exhibit of Ceará seed, and the U. P. A. Scientific Department were able to increase the interest of this by-product in the case of both Hevea and Ceará Seed by exhibiting for the first time samples of the Oil extracted from them by crushing and of the resulting Poonacs which can be used as Fertilisers.

The Show was much enhanced by a representative collection of Samples of Rubber of all kinds kindly lent by the Economic Botanist, Bangalore.

In the centre of the room was a small but interesting group of exhibits of Fertilisers (from Messrs. Peirce, Leslie & Co., Ltd.), insecticides, tools, &c.

Mention must also be made of two small exhibits of a special kind—one of Camphor, prepared in Mysore; the other of Arrowroot, prepared on the Shevaroys. Also of the Herbarium specimens sent up by the U. P. A. S. I. Scientific Department, and of certain leguminous and other plants (besides the specimens of miscellaneous rubbers from various countries mentioned above) kindly lent for the occasion by Mr. G. H. Krumbiegel, Economic Botanist, Superintendent of Government Gardens, Mysore. The plants, together with some foliage plants, were intended more particularly for decorative purposes, but some of them had an economic value that commended them to the special notice of planters and agriculturists generally.

Apart from plants and herbarium specimens, the little catalogue of the "Planters' Section under the auspices of the U. P. A. S. I." compraised 152 separate items; and it is gratifying to note that special reference to this section was made not only in the President's brief address at the close of the Exhibition, but also in the remarks of H. H. the Maharaja of Mysore in reply to that address. His Highness and his brother, the Yuvaraja, proceeded immediately afterwards to make a very careful inspection of the Planters' Section and were, by special request, accompanied by Mr. Anstead, who was able to enhance the interest of the exhibits in the eyes of the distinguished visitors by giving a number of explanations.

For a first attempt the "Planters' Section" may be considered to have been a success. Naturally it might have been done much better, and those who were responsible for its arrangement have learned during the course of the operation many ways in which it may be improved in future years. The great thing that is needed is more exhibits and more representative exhibits.

Should it be considered worth while to repeat the experiment another year, benefiting by this year's experience a better all round display can undoubtedly be made. Whether it is worth while is another matter. The expense is considerable and the gains are small, and the time devoted to it might, perhaps, be more profitably spent. However, with the advent of a Scientific Assistant in Mysore who could take charge of the Exhibition, and the possibility of it being held in Bangalore, undoubtedly the most suitable place for it, conditions will be changed and it may be well to repeat the experiment and incidentally to try and add to the collection of 'Gold Medals' for the adornment of the Office walls.

SECRETARY'S PAPERS.

I.—Valorization.

RUBBER.

Satisfied with the outcome of their Coffee Valorization Scheme—because it inflated prices, though this caused dislocation of markets and shrinkage of consumption—the Brazilian Government began last August to plan means of checking rubber exports from the Acre district next year by placing a prohibitive export duty on the product raised in Pará and Manaos; and by adopting a system of valorization with regard to Rubber. Interests identified with the Brazilian rubber trade first held a meeting in Rio de Janeiro in August for the purpose of discussing the valorization proposition. Another conference took place in September, when the Government was asked to take some action in aid of their efforts to advance the price of rubber, and it then appeared almost certain that the authorities of Brazil were going to at least double the export duty and very probable that they would decide to put in operation the valorization plan.

How far these reports were based on fact, and how far they merely represented efforts on the part of a syndicate to stimulate an advance in prices, cannot yet be stated.

But the constant clamour regarding Valorization cannot but be accepted as one of the signs of the times.

It has been well remarked, however, by an American importer of raw rubber that, if any valorization of rubber scheme is really contemplated, "it must be remembered that Brazil, in respect of rubber, is in a different position from its coffee production. It has a practical monopoly of the coffee supply, but a syndicate operating to control rubber has only a few years in which to protect itself and reap the advantages it now enjoys from the Amazon. In five or six years, at the latest, it will be faced with competition of the Eastern rubber producing countries, which last year received such an impetus in the laying down of rubber tree plantations."

COCOA.

While the agitation concerning valorization of Rubber was in progress, the Cocoa interests got to work and began trying to plan a scheme to engineer prices of that product to a higher level. Up to that time the manipulation of Rubber along valorization lines could only be said to have failed, but the apparent success of the Coffee valorization scheme outweighed considerations of this kind apparently. At any rate, early in September officials of the Brazilian Government were believed to have been working to form a combination among the Governments of Portugal, Brazil and Ecuador, the three chief cocoa producing countries, in order to advance the prices for cocoa beans. Indeed, an agent of the Portuguese Government was said to be in Bahia at the time in order to further the plans regarding cocoa valorization in conjunction with the Brazilian Senator and former Governor of Bahia, José Marcellino, who was the moving spirit in the undertaking. It was rumoured that a large London banking house which has been instrumental in carrying through the Brazilian coffee valorization was prepared to lend $10,000,000 for the above-mentioned purpose.

The three countries named control more than 50 per cent. of the world's total production of cocoa. In order to carry through the proposed scheme it would be necessary for the countries belonging to the combination to impose a heavy export duty on cocoa beans, and this export duty as well as the increase in local values which it is intended to obtain would naturally have

to be borne finally by the consumers in the countries where chocolate and other products of cocoa beans are principally used.

Producers in Ecuador have been showing much dissatisfaction with the prices they have been getting for Guayaquils, and it has been proposed that an extra export duty of a shilling should be imposed on every 100 pounds. Ecuador has practically no articles of export outside cocoa, and the low prices prevailing in this and other consuming countries, the cost of freight and other incidental expenses have brought about a declining revenue.

The promoters of "valorization" argue that wide fluctuations of prices could be prevented and that the prices of the various kinds could be equalized by determining the output in definite proportions.

The great obstacle is the deterioration of the bean if kept for any length of time. In this respect cocoa differs materially from coffee and pepper, which can be stored, as is done, and distributed at the international committee's discretion. Cocoa, on the other hand, becomes worm-eaten.

Receipts of cocoa have been very heavy of late; manufacturers were said to have stopped buying, to a very large extent, because they were loaded up; and the crops were estimated to be fairly large. Cocoa production, like other tropical crops, spices, cloves, etc., runs in cycles varying according to high or low prices. When high prices prevail and planters get large profits planting is at once increased. When prices decline through over production and the supply exceeds the demand planting falls off. As the trees take seven or eight years to mature, the crops on the plantings may vary greatly, independently of seasonal climatic conditions.

With heavy stocks on hand manufacturers might be expected to sympathise with any attempts of producers to give strength to values; but, as a matter of fact, great scepticism has been expressed with reference to this valorization project. No prudent manufacturer pins his faith to any scheme that is likely to put a check on the growth of consumption of the article in which he is mainly interested.

COFFEE.

It is well to remember, too, that the Coffee Valorization scheme has not yet been carried to a successful issue. It has appeared to be successful so far, but Nature has been kind. Comparatively short crops in Brazil have helped to make possible a profitable realisation of a portion of the Valorization holdings; but the stock in hand is still very large, and one "bumper crop" might cause the bottom to fall out of the whole scheme. The higher range of prices that has been witnessed is often attributed to Valorization, whereas it is mainly due to natural conditions; and it has not been entirely beneficial to either producers or dealers, for it has unquestionably stimulated the preparation, and the consumption, of "coffee substitutes," the trade in which has expanded very rapidly. About this, more will be said in a later paper, for the competition with Coffee here referred to has assumed serious proportions.

As for the alleged effects of valorization on speculative transactions and on wide fluctuations of prices, opinions differ. Fear, distrust and anger have been arosed among dealers. One has stated: "The whole atmosphere is surcharged with manipulation." It would be difficult to convince such a man that this manipulation is not identical with speculation, though it may well be that the speculative field is fenced in so that *he* cannot enter it. Moreover, as its worst, Valorization means something very like Monopolization; and that is a thing to be dreaded by all traders who are excluded from the inner circle and by consumers generally.

DISTRICT PLANTERS' ASSOCIATIONS.

Wynaad Planters' Association.

Proceedings of a Meeting held at Meppadi Club on October 11th, 1911.

PRESENT.—Messrs. Atzenwiler, Bownass, Darkin, Gillatt, J. C. Parke, G. C. Parker, Powell, Stewart, Vernede, Waddington, West and C. E. Abbott, Hon. Secretary. *Visitors.*—Messrs. Briggs, Dickson and MacBain. Mr. Waddington in the chair.

1713. *The Proceedings of the last Meeting* were confirmed.

1714. *New Members.*—Mr. D. B. Darkin was elected. Mr. H. A. Beachcroft was re-elected.

1715. *Roads.*—Read letter from Honorary Secretary to the Chief Engineer of the Mysore Government complaining of the state of the *Road between the Mysore Frontier beyond Sultan's Battery and Muddur*; and reply from the Chief Engineer stating that an estimate has been sanctioned for this road, and that every effort will be made to put it in order. Recorded with satisfaction.

Road 35 B. Sultan's Battery to Nellakotta.—Read letter from Mr. West stating that a great deal of good work has been done on this road, and that two bridges have been rebuilt very rapidly. The Honorary Secretary is to communicate this letter to the District Board Engineer.

1716. *Cattle Disease.*—Referring to para. 1710 August proceedings, a letter was read from the Deputy Collector of Wynaad, stating that measures had been taken to stamp out the outbreak, and that as no further cases had been reported and the epidemic had not spread, it was believed that these had been successful. No orders have been issued about the proposed Veterinary Hospital at Kalpatty.

1717. *U. P. A. S. I. Meeting at Bangalore.*—The Honorary Secretary read his report :—

You will have read the account of the Bangalore Meeting in the papers, and it is not necessary for your Delegate to prevent a lengthy report to you. But there are certain questions which you will have to discuss and come to a decision about.

There were two subjects which I was specially instructed to bring forward, and on both of these resolutions were passed by the Meeting on the lines desired by this Association. As regards the *proposed bonus on green tea* you will have seen that that there was a good deal of opposition. It is no use going over the arguments again. We have to congratulate Mr. J. C. Parker on having been elected to represent the U. P. A. S. I. on the Cess Committee, and we hope that he will be able to persuade that body to agree to what appears to us to be a very reasonable request. I made one alteration in the resolution passed last year, *viz.*, that the bonus should be paid on 4 million lbs. of green tea *to be exported from Southern India.*

The resolution about the *non-execution of warrants* was passed unanimously. The D. S. P., Nilgiris, has made a suggestion that a register should be kept for recording the history of all warrants, and if this is carried out it should be of real help to us. Mr. Martin took the leading part in the discussion on *Recruiting and Emigration.* This is a subject he thoroughly understands; it is the most important subject Planters have to consider to-day; and the community is under a great obligation to Mr. Martin for giving us the result of his experience. You cannot dispute his

facts; though you may argue about his deductions and his advice. Personally, I am convinced of their correctness, and I recommend them to your very serious consideration.

Much of the discussion took place in Committee, and much of it will not even be reported in the Book of Proceedings. But from reading the speeches in open meeting you have seen that there were two opinions expressed: one party belived in going on asking for Government help, and for a universal registration scheme; the other side declared that the scarcity of coolies is due to emigration, that Government will not move a finger to check emigration, and that our only hope is to make the cooly understand that he can do as well or better for himself in India. Last year we asked Government to have all contracts made by coolies who are about to emigrate attested, and that the attesting officer should satisfy himself that the cooly understands the conditions of his contract. Those are precautions that the Government of Madras insists on in the case of coolies coming to Wynaad, where they will work within a couple of days journey from their own villages and under the protection of Madras Magistrates. Government refused to interfere. A cooly may be sold by a recruiter, taken to a depôt, shipped across the sea and landed on an Estate saddled with a debt of Rs.150 of which he has not received an anna, and the Madras Government is entirely satisfied with the conditions of recruiting. So I think there is no use asking Government to help us to work out an elaborate registration scheme.

Another matter which has to be considered, is the *Financial Position of the U. P. A. S. I.* A resolution was passed asking District Associations to pay 2 annas an acre to the central Association for all purposes, including the Scientific Officer Fund. This was proposed by the Central Travancore Association. We are not asked for any increased subscription to the Scientific Officer Fund, and of course the suggestion does not apply to the Mysore Associations, who have already taxed themselves to pay for additional scientific aid. In our case the increase would not be very large. The fact is that the work at the Head-Quarters has increased a great deal of late years, and the Meeting considered that the Secretary ought to be paid more. There is a special office now occupied in Bangalore by himself and the Scientific Officer, the accounts have become more complicated, and a book-keeper has had to be engaged. At present we pay on 12,000 acres Rs.1,230; Rs.500 to the U. P. A. S. I. (4·1 cents) Rs.630 to the Scientific Officer Fund (5·2 cents) and Rs.100 to laboratory upkeep (less than 1 cent.) We are asked for 2 cents more, about Rs.270. You will have to decide about this.

The North Mysore Delegate proposed that two Meetings of the U. P. A. S. I. should be held annually. An amendment was carried in favour of Sectional Meetings of two or more Associations.

There are certain subjects in which groups of Associations are interested in common, the local discussion of which might shorten the proceedings at Bangalore, which, in the opinion of some, are becoming rather unwieldy.

The report was ordered to be printed. Mr. Abbott was thanked for his report and for the work he had done at Bangalore. The meeting congratulated him on having been appointed Chairman.

1718. *U. P. A. S. I. Subscription.*—With reference to the proposed increase of subscription, the following resolution was *proposed* by Mr. J. Carson Parker *seconded* by Mr. Atzenwiler and carried —"That this Association is willing to find its share of the enhanced subscription to the U. P. A. S. I. for this year, but feels that the question of Finance and Management should be inquired into as soon as possible."

As it is necessary to find funds for the above, it was resolved to levy a further 4 pies per acre assessment from January 1912.

1719. *Recruiting and Emigration.*—Read the advertisement drawn up by Mr. Aylmer Martin and the circular letter accompanying it.

Proposed by Mr. Atzenwiler *seconded* by Mr. Stewart and carried —"That this Association adopts the advertisement."

Members are requested to inform the Honorary Secretary of the number of advertisements they require, and the language they are to be printed in.

1720. *Madras Planters' Labour Law.*—Read correspondence between Mr. Nicolls and the Gudalur Magistrate in the case of Pongay Maistry, which Mr. Nicolls has sent for the opinion of the Association. Mr. Nicolls asked to have the accused, who had been convicted under Sec. 35, ordered to fulfil his contract and sent back to the estate under Police escort on the expiry of his sentence. The Magistrate has declined to do this, on the ground that the period of Pongay's contract which was from May 15th 1910, to March 14th 1911, has expired. He considers that Mr. Nicoll's only remedy is under Section 23, *i.e.*, that the Maistry can be ordered to repay the amount of his advance "within a reasonable time" or have his moveable property seized, According to this ruling, if a defaulting Maistry can avoid arrest till the period of his contract has expired, his employer has no remedy except under Section 23.

The Meeting was of opinion that the Magistrate is wrong, and hopes Mr. Nicolls will appeal against the decision.

Read also Mr. Nicoll's letter with copies of judgment in cases 209 and 210 against Kappini and Hootcha Maistries, in which convictions were obtained under Section 24, but in which Mr. Nicolls considers the sentences were inadequate. Neither Maistry had brought in the proper number of coolies. The Meeting considered that as the amount of punishment to be inflicted was left to the Magistrate's discretion, the Association could not interfere.

1721. *Administration of the Act.*—Mr. Waddington gave details of a case he had taken against N. Chulam Rasul Sahib, of Attoor, Salem. Mr. Bownass brought forward a case he had taken against a large land-owner in Trichinopoly in which the warrant was returned unserved.

The meeting was of opinion that these cases ought to be brought to the notice of Government, and instructed the Honorary Secretary to ask the Hon'ble Mr. J. G. Hamilton, through the U. P. A. S. I., to move in the matter.

1722. *Rules of the Association.*—With reference to a letter from Mr. Malcolm, it was decided to take up the question of revising the rules at the end of the year.

1723. *South Indian Planters' Benevolent Fund.*—The Honorary Secretary reminded subscribers that subscriptions should be paid now.

A vote of thanks to the chair terminated the Proceedings.

(Signed) H. WADDINGTON,
Chairman.

(„) C. E. ABBOTT,
Hon. Secretary.

CORRESPONDENCE.

Labour.

Dear Sir,—Referring to "Mysore Planter's" letter re Labour, I think things with us are going, and must go, from bad to worse, not because 4 annas is not enough for the Mysore cooly, or the Ghaut cooly in Mysore (these latter generally stipulate for cheap rice, that they may not be at the mercy of the bazaarmen).

It is because we get no assistance in Mysore from the authorities. There are a dozen ways how a defaulter, maistry or cooly, can *get off* and I want to know a simple way of getting a conviction—not so much for owing one *a balance* but for deliberately cheating; taking money from 2 or 3 estates; taking money and not attempting to bring a cooly.

There are practically no punishments for such offences, though I suffer Rs.2,000 or 5,000 damages, because I trust a man with Rs.500 advance; it is deemed a reasonable excuse if he says he was ill or has lost a near relative, though, until he is brought to book, such excuses have not been suggested. If you give a man time on learning of such troubles and he then fails you, you in your turn will be refused a warrant on the plea of time. I think the Associations should try and get the Law for this, and coffee stealing, thoroughly overhauled as far as Mysore goes. We need real punishments —the Code is there. There are no adequate punishments inflicted in Mysore for anything but personal violence. Since about '75, in Coorg I know, Receivers and Pepper Thieves have had to put up with 2 years imprisonment when caught.

In Mysore, the trade is in a flourishing state, being thoroughly recognised by the Police. I differ with the Inspector-General of Police, or rather the Magistrate of Hassan District, who attributes no cases of coffee stealing, "to the vigilance of the Police." As the punishments are—1st offence, *nil*, or 3 days; old offenders, after 3 or 4 hearings, perhaps a month, and for Respectable Tradesmen—the Receiver, Five Rupees, and asked not to do it again—can you in the face of such punishments expect the Police to take any interest in coffee cases? It doesn't pay.

I am situated 25 miles from Head-quarters, and *every* Bazaar and one Patel between my property and Chickmaglur make a *business* of receiving Coffee in the season. Then there are the larger Sowcars who approach in carts and who collect Seegee and other things.

Timeo Danaos et dona ferentes.

Yours faithfully,

H. W. RAIKES.

Nitrate of Lime.

Dear Sir,—With reference to Mr. Anstead's remark on page 633 of your last number (October 14th) we should be much obliged if you would kindly insert the following opinion of a very competent authority on the hygroscopic property of Nitrate of Lime, as the Scientific Officer's opinion is likely to prejudice Planters against this fertilizer. Mr. James Hendrick, Chemist to the Highland and Agricultural Society of Scotland, states in their "Transactions for 1909," page 126:—"That Nitrate of Lime is hygroscopic (deliquescent) is not a disadvantage once it is applied to the soil, but an *advantage*, as it will ensure that it will soon become disseminated through the soil, and reach the root of the plants. It will in this respect act even more readily and quickly than Nitrate of Soda."

It will thus be seen that in Mr. Hendrick's opinion, which is also the opinion of other competent authorities, this characteristic of Nitrate of Lime is an *advantage* rather than otherwise.

for T. STANES & CO, LTD.,

F. T. STANES,

Director.

Coimbatore, 18th October, 1911.

Nitrolim.

Dear Sir,—" Nitrorot's" letter in your issue of October 14th has already been so well answered by the Scientific Officer that it appears unnecessary for us to make any special reply to it. As a matter of fact we welcome " Nitrorot's" letter and would gladly see more discussion of the same kind on the subject of fertilisers even when, as in the case of " Nitrorot," it might not always be complimentary: we believe we have a good thing for sale and consequently the more discussion about it and the more clearing up of errors such as have existed in the mind of " Nitrorot" the better for us and the better for the North Western Cyanamide Company.

On this occasion we would like to thank " Nitrorot " for having introduced the Ground Nut Cake and Lime comparison: as Mr. Anstead has already remarked, Nitrolim is not strictly comparable with Poonacs but, putting this on one side for the moment, we would remark that it would take very nearly 3 tons for the Ground Nut Cake that " Nitrorot " has in view to supply the same amount of Nitrogen as is obtained from one ton of Nitrolim. This would make the cost on the Coast of the Ground Nut Cake and the Lime required to equal one ton of Nitrolim Rs.277, or Rs.77 more than the Nitrolim: in addition to this the very important point of cartage has to be considered and we presume that " Nitrorot" would sooner pay for two carts than for six carts.

May we in closing express the hope that " Nitrorot" does not propose to mix his Lime with the Ground Nut Cake after all Mr. Anstead's teachings on the subject!

for PEIRCE, LESLIE & CO., LTD.,

(Sd.) J. CHRISTIE,

Director.

Calicut, 20th October, 1911.

The Mysore Dasara Exhibition.

Dear Sir,—We beg to draw your attention to an omission in the issue of *The Planters' Chronicle* of 21st instant, under the above heading, with reference to our exhibit of Fertilisers. In Class VIII—Manures, for No. 4 —" Best Collection of Fertilisers"—we received the Gold Medal awarded for the best exhibit, and for No. 3—" Collection of mineral and chemical fertilisers analysed and described"—we have been awarded a Silver Medal.

We may mention that we have been also awarded a Silver Medal in Class VII—Chemical Industries, for our exhibit of Acids under " Chemicals of Indian Make;" and another in Class V for our Stoneware Acid-proof jars made at Ranipet.

We shall be obliged by your pointing out the omission in your next issue.

for PARRY & CO.,

(Signed) J. BERNARD.

Ranipettai, 24th October, 1911.

INDIAN TEA ASSOCIATION, CALCUTTA.

Extracts from Abstract of Proceedings of a Meeting of the General Committee, held at Calcutta, on October 6, 1911.

Correspondence with the Indian Tea Association London.—Letters dated 1st, 8th and 14th September from the Indian Tea Association, London, which had been previously circulated, were now brought up for final consideration. . . . .

Scientific Department.—In connection with the appointments of entomologist and mycologist to the Association, it was stated, in the letter of 1st September, that the Director of the Royal Botanic Gardens, Kew, had recommended Mr. C. K. Bancroft Federated Malay States, for the post of mycologist. Mr. Bancroft appeared to possess the necessary qualifications, but he was married. The London Committee asked, however, whether in the event of their failing to get an unmarried man with the requisite qualifications, the Calcutta Committee would be prepared to accept Mr. Bancroft and, if so, to what limit of pay they could go.

The General Committee decided to reply that they could not in any circumstances entertain the idea of appointing a married man to the post, as there would not be any quarters at the new Tocklai Experimental Station suitable for him. With regard to the question of pay, the Secretary was directed to submit a note to the Committee showing what the particulars of the appointment were and the instructions giving to the London Association in connection with it.

In connection with the post of entomologist, it was mentioned in the letter of 14th September that Mr. Egbert A. Andrews of Bradford had been offered the appointment. Mr. Andrews was 22 years of age and had just graduated at Cambridge with first class honours in Part I of the Natural Sciences Tripos in 1910 and first class honours in Part II of the same examination in 1911. Mr. Andrews was strongly recommended by a number of professors and masters in Cambridge, and provided he passed the medical examination, he would be confirmed in the appointment. Before leaving for India he would undergo a course of field work. Another gentleman had been under consideration for the appointment of mycologist, but having been offered a home appointment he had withdrawn from his candidature.

Calcutta Port Commissioners—The tea warehouse.—The Committee had received from the Calcutta Port Commissioners a letter of 26th September, forwarding copy of a correspondence the Commissioners had had with the Calcutta Tea Traders' Association with reference to the accommodation at the tea warehouse. . . .

It was understood that the Tea Traders' Association were arranging a meeting with sellers in order to discuss the matter.

Scientific Department—The Tocklai Experimental Station.— A note by the Scientific Department Sub-Committee was submitted. It stated that the expenditure in connection with the new Experimental Station at Tocklai would exceed Rs.40,000, and it was mentioned that the ultimate cost would probably not be short of half a lakh of rupees. The Sub-Committee had, as far as was possible, kept down expenditure, but they were unable to bring it down below the figure stated. The question of how the necessary expenditure should be met was meantime deferred.

It was anticipated that the laboratory and bungalows at the station will be completed during the course of the coming cold weather.

TEA.

Recent Experiments on Tea in Java.

Mr. A Gordon Howitt, B. Sc. (Berlin) writes in *The Home & Colonial Mail* of September 1st, 1911 :—

It is now generally admitted that the only practicable method of ascertaining the proper cultivation and manuring of sub-tropical and tropical economic plants is by carefully conducted experiments. At one time it was believed that the analysis (chemical and physical) of a soil was necessary as a preliminary to actual experimental work, but this rather expensive process is obviously of little value, since in the first place it is difficult to obtain a sample of soil which may be taken as an average of any plantation, and secondly, the results so obtained—this is, the percentage of the plant-foods, nitrogen, phosphoric acid and potash, determined by using a 1 per cent. solution of citric acid—give no direct clue to the possibilities of that soil, and to the availability of the plant-foods therein. Looking over a large number of analyses of typical soils, from gravels up to heavy clays, one is struck with the small variations in the percentages of the essential plant-foods, and these small variations do not coincide with the great differences which actually exist in the fertility of the different classes of soils. Noteworthy, also, is the fact that even the percentages for the poorest soils show, when calculated per acre, a quantity of plant-food which is far more than is required by ordinary crops. For instance, Chemists tell us that, if the percentage of potash found by a 1 per cent solution of citric acid is above ·01 per cent., then there is sufficient potash in the soil and the application of soluble potash manures is unnecessary. In giving this statement they overlook not only the many other factors which make up the fertility of a soil but also the "ranging" powers of the roots of the various crops, e.g., the deep roots of wheat as compared with the shallow roots of barley. Let us examine what ·01 per cent potash really means. The apparent density of average soils is a little over 1, and taking the weight of a cubic foot of water at 62·5 lb., the weight of soil, calculated to a depth of 1 foot, gives roughly, 3,000,000 lb. per acre. Now ·01 of this is equal to 300 lb. per acre, and even this is a considerable amount, or as much as would be contained in fully 5 cwt. of muriate of potash. Yet experiments have proved over and over and over again that the addition of, say, 1 to 2 cwt. of soluble potash manures to these soils, together with nitrogenous and phosphatic manures, has given not only an increase, but a profitable increase, over the unmanured and incompletely-manured plots. To sum up the matter in characterestic American terseness, much of the natural potash in soils is "just about as soluble as window glass" and so to secure a vigorous start for the young seedlings there must be present in the soil readily available supplies of all the essential plant-foods, including potash. Planters are beginning to recognise this from actual experience, with the result that complete, well-balanced manures, containing nitrogen, phosphate and potash, are being more and more used every year.

Recent confirmation of this is given in the experiments conducted by Mr. R. von Nordheim, on tea plantations in Java. These experiments were introduced in 1907, and the plots, four in number, were carefully chosen to ensure that they were all on the same level, and that the soil, by previous results, was practically uniform.

The area in each case was, approximately, one bouw, equal to 1¾ acres, though the main point governing the area of each plot was the number of

bushes, which was 6,000. The scheme of manuring of the four plots was as follows :—

1. Unmanured (0).
2. 2 kg. crotolaria leaves, as green manuring per bush (nitrogen).
3. Green manuring as in 2, with 20 grams 40 per cent. superphosphate (nitrogen and phosphate).
4. Manuring as in 3, with 30 grams 50 per cent. muriate of potash (nitrogen, phosphate and potash).

The crotolaria leaves, which, on analysis, showed ¾ per cent. nitrogen, and from one-fifth to one-tenth per cent. of phosphate and potash together, were chopped up, and well mulched into the soil, whilst the artificial manures were distributed evenly around each bush, in a circle about 1½ feet from the stem. The cultivation received by each plot was the same, and the results from December, 1907, to November, 1909, were as follows :—

	Unmanured		Green manuring only	
	1st qual.	2nd qual.	1st qual.	2nd qual.
	lbs.	lbs.	lbs.	lbs.
From December 1907 to November 1909, Green leaves ...	1,544	6,148	1,604	6,279
Dry tea for two years' harvest ...	1,789		1,833	
Increase over unmanured ...			44	
Value of increase at 9*d*. per lb. ...			33*s*.	

	Green manuring with phosphate		Green manuring with phosphate and potash	
	1st qual.	2nd qual.	1st qual.	2nd qual.
	lbs.	lbs.	lbs.	lbs.
From December 1907 to November 1909, Green leaves ...	1,513	6,216	1,671	6,810
Dry tea for two years' harvest ...	1,797		1,972	
Increase over unmanured ...	8		183	
Value of increase at 9*d*. per lb. ...	6*s*.		137*s*. 3*d*.	

In order to make sure that such a favourable result to the application of a complete, well-balanced manure was no chance result, another set of experiments on younger tea was commenced in April 1909, with the only difference that the number of bushes was 3,000 and the area accordingly of each plot was ½ bouw, or seven-eighths of an acre. In this experiment also, the artificial manures were not distributed over the crotolaria leaves, and mulched into the soil on the upper side of each bush.

The manures, which need not be quoted, were just half the quantities used in the former experiment, and the results from April, 1909, to December, 1910, were as follows :—

	Unmanured 1st qual. lbs.	Unmanured 2nd qual. lbs.	Green manuring only 1st qual. lbs.	Green manuring only 2nd qual. lbs.
From April 1909 to December 1910, Green leaves ...	750	5,618	766	6,039
Dry tea for 20 months' harvest ...	1,449		1,550	
Dry tea for one year's harvest ...	869		930	
Increase over unmanured ...	—		61	
Value of increase at 9*d*. per lb. ...	—		45*s*. 9*d*.	

	Green manuring with Phosphates 1st qual. lbs.	Green manuring with Phosphates 2nd qual. lbs.	Green manuring with Phosphate and Potash 1st qual. lbs.	Green manuring with Phosphate and Potash 2nd qual. lbs.
From April 1909 to December 1910, Green leaves ...	706	5,538	789	6,536
Dry tea for 20 mos. harvest ...	1,424		1,663	
Dry tea for one year's harvest ...	854		998	
Increase over unmanured ...	Decrease of 15		129	
Value of increase	Loss		96*s*. 9*d*.	

Commenting on these results, Mr. Nordheim states that as these experiments were carefully conducted under the supervision of European planters, one may safely conclude that the two essential plant-foods in this plantation are nitrogen and potash, for from both experiments the addition of superphosphate diminished rather than increased the yields. One has abundant proof, however, of the advantage of the application of artificial manures, in addition to green manuring. . . .

It is a common belief that increase in quantity is gained at the expense of quality, and to ascertain whether any truth lay in the statement, Mr. Nordheim sent samples of the tea from each part to the Tea Expert Bureau, Bendoeng. These samples were only distinguished by numbers, and in this way the tea expert had no idea as to the purpose for which the test is required. Taking as a standard for comparison the best quality Assam tea, the report of the specialist was as follows:—

1. (Fully manured plot) Best quality, fine aroma, of great strength, and fine, clear infusion. 2. (Without potash) Inferior quality, not the same strength, placed in class 2. 3. (Green manuring only) Still inferior to No. 2. 4. (Unmanured) Very inferior quality.

From the second experiment, samples were also sent to the tea expert, and the results corroborate the above statement, except that the sample from the "unmanured plot" proved to be of better quality than the "without potash" and "green manuring" only samples.

Here, then, we have convincing proof of the value of potash manures to tea plantations.

RUBBER.

"Para *versus* Ceylao."

One of the principal factors in estimating the future of rubber, is the prospective increase in the Oriental supply. In his interesting review of the subject (in the Portuguese language), "Pará *versus* Ceylao," Senhor J. A. Mendes, of Pará, has grouped a number of statistical returns; extending the scope of his observations so as to include the Asiatic yield in general.

WORLD'S PRODUCTION AND CONSUMPTION.

Taking the natural starting point, the record of the world's production and consumption during the five years preceding 1910, the following result is shown:—

	Production.	Consumption.
1905	69,507 tons.	65,727 tons.
1906	67,918 ,,	71,671 ,,
1907	68,646 ,,	64,628 ,,
1908	67,031 ,,	67,081 ,,
1909	69,372 ,,	70,075 ,,

Production and consumption thus kept on about a level during this quinquennial period.

Calling the annual production for 1909, 70,000 tons, its sources are shown to be approximately:—

	Tons.
South America	40,000
Central America, etc.	12,800
Ceylon, Malay States, etc.	6,500
Africa	10,700
Total tons ...	70,000

While a normal or moderate degree of increase might be witnessed from other sources, Senhor Mendes gives prominence to that anticipated from Asia.

ASIATIC EXPORTS OF RUBBER.

Although the 1909 amount quoted is somewhat less than that already shown in the general summary, the general statistical bearing of the figures below is not affected; as embracing the aggregate exports of rubber from Ceylon, Malay States, Sumatra, Java, India, etc.

	Tons.
1905	145
1906	510
1907	1,010
1908	1,800
1909	3,600
1910 (estimated)	8,000

The gradual increase recorded for the more recent years, is the direct result of the development of planting. This view of the case is supported by the statement that there are now in the Malay states and Ceylon, over 600,000 acres, planted with more than 21.000.000 *Hevea* trees, almost in a productive condition; to the relative maturity of part of which is due the augmented figure of rubber exports.

COMPARISON OF BRAZILIAN AND ASIATIC QUALITIES.

While the question at issue has been mainly treated from a statistical point of view, an interesting and lengthy quotation from a recent article in the "Bulletin de l'Association des Planteurs de Caoutchouc," gives impartial prominence to the comparison drawn between the two classes of rubber. It

points out that there is no chemical reason for preferring one or the other; both being of the same botanical family and produced under climatic conditions of a similar character. Moreover it is added, there is no more difference between them than may be found between the products of differerent regions of the same country.

On the other hand, Senhor Mendes, while giving impartial prominence to the foregoing extract, urges the uniform character of the Pará article and the confidence in its use, which manufacturers feel after long years of experience. Reference is likewise made to the fluctuations which had, up to the time of writing occurred in the relative values of the two descriptions. These differences have, however, been more or less adjusted by later market developments.

Hence the statistical aspect of the case, apart from that of quality calls for the prominent attention it has received.

The Question of Consumption.

From figures already quoted, it will be seen that consumption in 1909 was 70,075 tons, as against production 69,372 tons. Whether the supply to be figured upon is 70,000 tons or a smaller amount, at this point the question of consumption naturally arises and has been dealt with by Senhor Mendes. Taking for the future the basis of a 5 per cent. yearly advance on rate for 1909, he estimates consumption of the following scale:—

	Tons.
1909	70,075
1910	73,573
1911	77,258
1912	81,121
1913	85,177
1914	89,436
1915	93,908

Deducting from the estimated production 142,242 tons the estimated consumption 93,908 tons, there would still remain in 1915 and 1916 a surplus production of 48,334 tons, should Sir, John Anderson's anticipations be realized, or of 12,064 tons on the basis of Mr. Rutherford's predictions. The Asiatic supply is consequently the dominant factor in the situation.

Estimated Decrease in Amazonian Production.

Of more immediate interest is the estimate of Senhor Mendes of the general result for the year 1910 and 1911, shown as follows in almost the last page of this work:—

	1909/1910. tons.	1910/1911. tons.
World's production. ...	70,000	70,000
Increase from the East ...		4,000
		74,000
Decrease from the Amazon (10% of 1909 amount as) ...		3,913
	70,000	70,087
Consumption ...	70,000	73,500
Shortage in production estimated 1910/1911. ...		3,413

Against this shortage would come the excess in Pará stock, which was on January 1, 1911, 5,852 tons as compared with 3,278 tons a year earlier. —*The India Rubber World.*

The Planters' Chronicle.

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The Scientific Officer.

On the 12th instant Mr. R. D. Anstead, B. A., will leave head-quarters in order to attend an Agricultural Conference at Pusa, whereat the subject of the control of importation of plants will be discussed, with a view to legislation for the purpose of preventing the entry into India of foreign plants that are infected with disease or pests. The subject is one of very great importance, and it is well that the interests of planters in Southern India should be represented by so capable a guardian as the Planting Expert.

The date of Mr. Anstead's return is somewhat uncertain, but there is every probability that he will be back in Bangalore by the first week in December. In the meantime letters for him should be addressed, as usual, to the office.

Books.

Arrangements are being made for the receipt of early information concerning new books published, or in the press, relating to products, etc., in which planters in Southern India are interested. Planters will, of course, be at liberty to order such books direct or through their agents, but it is suggested that if a number decide to import through the U. P. A. S. I., a reduction of price will, in all probability, be secured.

The following is a list of such books that was received from London by the last mail :—

THE RUBBER PLANTER'S NOTE-BOOK.

A Handy Book of Reference on Pará Rubber Planting. With Hints on the Maintenance of Health in the Tropics, and other general information of utility to the Rubber Planter. Specially designed for use in the Field. Compiled from the most reliable and modern sources by Frank Braham, F.R.G.S. With Diagrams and Photographs. F'cap 8vo. Price about 2/6*d.* net. London : Crosby Lockwood & Son. (*Just ready*).

(Mr. Braham is a practical planter from West Africa, and is now Manager of the Liberian Rubber Corporation, Ltd. The correspondent in London who has mentioned the book in one of his letters remarks : "I have seen some of the proof sheets of the work, and I think it will be a most useful and handy book.")

THE CULTIVATION AND PREPARATION OF PARA RUBBER.

Second edition re-written and greatly enlarged by W. H. Johnson, F.L.S., ex-Director of Agriculture, Gold Coast Colony, West Africa, Director of Agriculture, Mozambique Company, East Africa. Commissioned by Government in 1902 to visit Ceylon to study the methods employed there in

the Cultivation and Preparation of Pará Rubber and other Agricultural Staples for Market, with a view to introduce them into West Africa. London: Crosby Lockwood & Son. Cloth, 192 pages, with numerous illustrations. Price 7/6*d*. net. (*Just published.*)

The following are extracts from the Preface:—

"The principal object I have in view in writing this small treatise on the Cultivation and Preparation of Pará Rubber is to endeavour to give to the continually increasing number of persons taking up Rubber Cultivation such practical advice on the various matters connected with that comparatively new industry, as would be likely to assist them in their undertaking. . . .

"The Second Edition includes all the latest authentic information, and covers a far larger range of subjects likely to be of interest or utility to those in any way connected with the rubber industry."

DRYING MACHINERY AND PRACTICE.

A handbook on the theory and practice of drying and desiccating, with classified description of installations, machinery, and apparatus, including also a Glossary of Technical Terms and Bibliography by Thomas G. Marlow, Grinding, Drying, and Separating Machinery Specialist. With 22 Tables, 17 Plates, and 173 Illustrations. London: Crosby Lockwood & Son. 326 pages, with Folding Plates. Price 12/6*d*. net. Postage to India 1*s*. 3*d*. (*Just published.*)

It is stated in the Preface that this "handbook is intended to give an insight into the art of Drying, and descriptions of typical designs of the mechines and apparatus used in drying and Desiccating.

"In order to do so the general principles which govern the various methods of removing moisture (water) from all kinds of materials have been briefly stated, followed by a summary of the several methods employed, together with the tables of calculations necessary in deciding the requisite capacities. Then the apparatus, machinery, and installations of plant are described and illustrated by modern typical examples. These have been chosen by the makers as worthy of bearing their name, and the descriptions have in every case been passed by them.

"The innumerable kinds of material which have to be dried, the varrying degrees to which this dryness is needed, and the many types of apparatus which are in use open up a vast field of research. As it is quite impossible to deal exhaustively with such a wide subject, or while retaining a due proportion to exhaust even one section, there has been added a Bibliography so that reference can be made to the entire literature on any desired point. The Glossary of Terms appeared to be an absolute necessity in the absence of any authoritative manual on the subject, and it is hoped this may form a basis for future use of the terms and classifications."

FERTILISERS AND FEEDING STUFFS.

Their Properties and Uses, by Bernard Dyer, D. Sc., F.I.C., Consulting Chemist to the Essex, Leicester, and Devon Agricultural Societies; Official Agricultural Analyst for the countries of Bedford, Cornwall, Essex, Hants, Herts, Leicester, Rutland and West Suffolk. With the Full Text of the Fertilisers and Feeding Stuffs Act, 1906, the Regulations and Forms of the Board of Agriculture and Notes on the Act by A. J. David, B.A., LL.M. (Cantab.), of the Inner Temple, Barrister-at-Law. Sixth Edition, Revised. London: Crosby Lockwood and Son. Cloth, 160 pages. Price 1*s*. net. (*Just published.*)

Scientific Officer's Papers.

LXXXI.—Retention of Fertilisers by the Soil.

Many of the fertilisers applied to Coffee in this country are readily soluble in water and, consequently, it is of great importance to know what their ultimate fate is likely to be when their application is followed by heavy rain. Few fertilisers remain in the soil unchanged until they are used by the plant or washed out into the drains.

In the case of Sulphate of Ammonia a reaction at once takes place with the Lime present as Calcium carbonate, resulting in the formation of Calcium sulphate, which is washed out into the drains, and Ammonium carbonate which is retained by the clay and humus, and gradually changed into Nitrates, in which form the Nitrogen becomes available to the plant. Hence the retention of the valuable part of this fertiliser depends upon the presence in the soil of sufficient quantities of Lime, clay, and humus.

Nitrates, like Nitrate of Soda, are not retained by the Soil and they are easily washed out into the drains and lost. All organic nitrogenous fertilisers are ultimately converted into Nitrates by the process of decay and nitrification by bacteria, and in this form are liable to be lost. It is only when nitrification proceeds at the same rate as the absorbtion by the plant roots that all can be used. In practice this means that there is always a loss in the drainage water which cannot be avoided.

Potassic fertilisers, such as Sulphate of Potash, Muriate of Potash, and Saltpetre, undergo a reaction in the soil with the Lime present as Calcium carbonate. A Carbonate of Potash is formed and Calcium sulphate, Calcium chloride, and Calcium nitrate, which are washed out of the soil into the drains and finally carried away by the rivers. Clay appears in this case to play the chief part in retaining the Potash which forms a loose combination with the hydrated double silicates. This compound is insoluble in water and so is not washed out of the soil by the rain. At the same time it is soluble in weak and dilute acids such as are found in soil water and excreted by the roots of plants so that it is available as plant food. Soluble Potash salts applied to the soil are retained chiefly by the surface soil, though some find their way into the sub-soil.

Soluble Phosphates, like Superphosphate, when applied to the soil react with the Lime present as Calcium carbonate, and also with hydrated Iron oxides and hydrated silicates of Aluminium such as are found in Clay. When the phosphates combine with Calcium carbonate a di-calcium phosphate is formed, a compound insoluble in water, but soluble in dilute weak acids and thus available to the plant.

In all these cases the great importance of the presence of Lime in the Soil is manifest. When a fertiliser like Superphosphate is applied to a soil containing plenty of Lime it is quickly disseminated through the ground in a state of fine division readily available to plants, since wherever a particle of it comes in contact with a particle of Lime, the reaction described above takes place and a particle of di-calcium phosphate is precipitated.

If, however, the soil is deficient in Lime the Phosphate reacts chiefly with the Iron and Aluminium compounds and the resulting compounds are not only insoluble in water, but insoluble in dilute acids also, and though the phosphate is retained in the soil it is not available to the plant, and as a fertiliser is useless.

On such soils the full benefit of an application of Superphosphate is not obtained unless they are previously well limed. Even a subsequent liming of a soil which contains phosphates of Iron and Aluminium, accumulated

from previous applications of soluble phosphates, is beneficial, because the reverse action takes place resulting in the formation of di-calcium phosphate and hydrates of Iron and Aluminium again.

In South Indian Coffee soils, which are nearly all deficient in Lime, the phosphates applied as fertilisers, and occurring naturally, often exist as insoluble compounds of Iron and Aluminium.

Quite recently I had some soil analyses sent to me which showed that though the total phosphoric acid content of the soil was something like 0·06% the amount available was only 0·006% and in some cases it was returned as a mere trace. The Lime content was only 0·4% while there was Oxide of Iron 10·7% and Alumina 6·5%. Undoubtedly all the phosphoric acid which should have been available for the plant was combined with the Iron and Aluminium in an insoluble form. Lime would set this free and it would be practically useless to apply phosphatic fertilisers until the soil had been well Limed.

Unfortunately very few planting districts are in the neighbourhood of deposits of Limestone, and consequently Lime becomes an expensive fertiliser on account of the cost of cartage. From what has been said, however, it will be seen that, expensive or not, Lime is a *necessity* if mineral fertilisers are being used, and more money is probably being wasted by applying fertilisers which do not have a full effect because Lime is absent, than it would cost to apply Lime. It would be more economical to spend more money on Lime and less on fertilisers.

It will be noted that the use of fertilisers like Sulphate of Ammonia, and Sulphate of Potash, cause Lime to be constantly removed from the soil by means of the formation of Calcium sulphate which is washed out into the drains. Hence the constant use of such fertilisers on soils already deficient in Lime will in time exhaust all of this constituent and the soil will then become sour and unfertile. If mineral fertilisers are used, Lime must be applied to South Indian Soils from time to time, both to obtain the full benefit from the fertilisers, and to prevent the soil ultimately becoming sour.

It will be apparent from what has been said above that the power of the soil to retain some fertilisers and not others has a most important bearing upon the time of year when different fertilisers should be applied. Potash and Phosphates are retained by the soil and are not liable to be washed out of it, so that these fertilisers may be safely applied just before the monsoon, provided that they are worked into the top soil and covered up with mulch so as to avoid surface wash. As soon as they are washed into the soil they combine with it and are retained as has been described.

In the case of Nitrate of Soda and Saltpetre, however, the case is quite different. The former will be washed into the subsoil and out into the drains and so should never be applied before the monsoon, but rather at a time when there are only very light showers sufficient to work it into the surface soil.

In the case of Saltpetre the Potash only will be retained if it is applied in the monsoon and the Nitrate which is its most valuable component part will be washed out.

These points should be taken into most careful consideration when applying fertilisers. It is money thrown away to apply Nitrate of Soda or Saltpetre one day and a few days later to have 20 or 30 inches of rain on the top of them.

RUDOLPH D. ANSTEAD, *Planting Expert.*

DISTRICT PLANTERS' ASSOCIATIONS.

Coorg Planters' Association.

Proceedings of a General Meeting held in the North Coorg Club, Mercara, on Thursday, October 19th, 1911.

PRESENT.—Messrs. Mann, Irwin, Tweedie, Haller, W. R. Wright, A. J. Wright, Maclean, Martin, Tipping, Mahon, Grant, Newbery, Bracken, Grove, R. D. Anstead, Planting Expert, and W. M. Ball, Honorary Secretary.

Mr. G. K. Martin was unanimously voted to the Chair.

The Honorary Secretary read the report of the Delegates to the U. P. A. S. I. Conference, which had been already circulated among the Members. After some discussion, during which the Honorary Secretary read the draft Labour circular and explained what was being done and Mr. Anstead spoke on the Hybridisation Scheme, the report was passed.

Mr. Mahon proposed and Mr. Maclean seconded a vote of thanks to the Delegates.—Carried *nem. con.*

Mr. Tipping proposed that in future the Committee do select a number of those suitable for, and willing to act as, delegates to the U.P.A.S.I., from which list the Delegates shall be balloted for. Seconded by Mr. Grant.—Carried.

Scientific Officer's Assistant—Mr. Mahon brought forward this subject in a speech warmly supporting the Scheme, and proposed that an Assistant to the Scientific Officer be procured for Coorg by a cess up to, if necessary, Rupee one per acre. Mr. Mann cordially seconded the proposition and proposed that a small Sub-Committee be formed to draw up an appeal to those Members who were not present. Some discussion followed, during which Mr. Anstead spoke and explained the qualifications necessary in an Assistant and the salary required, etc. It was finally decided that 12 annas an acre on 16,000 acres would pay all expenses to the U. P. A. S. I. in connection with the scheme, and 14 members present representing an aggregate of 9,750 acres guaranteed their support.

Mr. Bracken proposed that Messrs. Mahon, Mann, Irwin, and Ball be a Sub-Committee to draw up a circular explaining matters to those members who were not present. Seconded by Mr. Maclean.—Carried.

Cattle Trespass Act.—Read letter from Mr. Shaw complaining of the difficulty of getting damages under the Act. This was corroborated by Mr. Mahon.

Mr. Mann proposed that the Honorary Secretary do write to the District Magistrate and ask for a ruling on the Act. Seconded by Mr. Bracken.—Carried.

Roads and Communications.—Read letter from the Commissioner of Coorg *re* the Sidapur-Pollibetta Road informing the Association that the centre line of the road would br traced and calling attention to a Resolution of the Coorg District Board as follows:—"Resolved that subject to the condition that all land required for the Road be given up without compensation the Board is prepared to consider favourably the proposal to construct the Sidapur-Pollibetta Road."

Mr. Anstead showed to the meeting the gold medal won by the U. P. A. S. I. at the Mysore Industrial Exhibition. Mr. Ball proposed a vote of thanks to Mr. Anstead for all the trouble he had taken in the matter. Mr. Mahon, in seconding, wished to add the thanks of all present to Mr. Anstead for coming so far to attend the meeting.—Carried *nem. con.*

Mr. Anstead, in returning thanks, said many thanks were due to Mr. Mahon for the liberal quantity of coffee supplied.

A vote of thanks to the Chairman closed the meeting.

The Sub-Committee met at once and drew up a circular *re* the Scientific Officer's Assistant, giving the names and acreage represented by those members who have already guaranteed their support.

This is now being circulated, and it is proposed to call a meeting at as early a date as possible after replies have been received.

Three new members were duly proposed and elected, *viz*:—E. P. Playford, Esq., A. F. Magniac, Esq., and H. W. Sheldrick, Esq.

(Signed) W. M. BALL,
Hon. Secretary, Coorg P. A.

Bababudin Planters' Association.

A Quarterly General Meeting was held at Chickmagalur, on October 30th, 1911.

PRESENT.—Messrs. Denne (President), Allardice, Hugonin, Meppen, Raikes, Watson, and Kirwan (Honorary Secretary). Hon. Member: Mr. K. R. Srinivasa Iyengar. By Proxy: Messrs. C. Courpalais, W. R. Courpalais, Johnson, and Kerr.

The minutes of the last meeting were read and confirmed.

Roads.—Mr. Kerr's complaints and the ensuing correspondence with the Executive Engineer were read. The Honorary Secretary was instructed to reply to the Executive Engineer that if a "Lump Sum" Contract were granted for a period of years, some one might be induced to take up the contract.

Report of Delegates to the U. P. A.—The report of the Delegates was read, and a vote of thanks to them passed.

Labour.—Resolved: "That a committee be formed to consider the question of Labour and to act in concert with the Committees of the North and South Mysore Association." Committee: Messrs. Hugonin, Kirwan, and a representative from Santaveri. By request, Mr. Lund, a member of the North Mysore Planters' Association Labour Committee, addressed the meeting on the subject.

Scientific Assistant Scheme.—The Honorary Secretary was instructed to collect the balance subscription of 6 annas per acre by the end of the year.

(Signed) NOEL G. B. KIRWAN.
Hon. Secretary.

TEA NOTES FROM FORMOSA.

Mr, Consul Samuel C. Reat, Tamsui, reports:—

The Taihoku Tea Merchants' Guild in Formosa, recently applied to the Government for an extension of the districts covered by the regulations for the union of the tea merchants issued in September, 1898. The purpose of the guild is to include the tea packers, who are now scattered over outlying districts, under one organization. When this is accomplished the guild will begin an active campaign for bettering the quality of tea, improving the method of packing and extending the market in foreign countries.

CORRESPONDENCE.

Nitrate of Lime.

Dear Sir,—My good friends Messrs. T Stanes & Co. quote Mr. Hendrick, Chemist to the Highland and Agricultural Society of Scotland, as saying, "that Nitrate of Lime is hygroscopic (deliquescent) is not a disadvantage *once it is applied to the soil.*" Exactly, that is just the point, it is before it is applied to the soil that the deliquescent properties of this fertiliser are a disadvantage. It is a matter of storage.

Will Messrs. Stanes & Co. inform the planter how he is to store a deliquescent substance on his estate during a couple of months of heavy monsoon, and will they guarantee that the packages in which they supply it will ensure that it neither cakes nor melts? Indeed can Messrs. Stanes assure me that even in their own stores, in the comparatively dry climate of Coimbatore, Nitrate of Lime does not cake hard in the barrels on storage. .

I do not wish to prejudice planters against the use of this or any other manure, and I believe that Nitrate of Lime has given equally good results with cereals as Nitrolim. I am sure, however, that Messrs. Stanes & Co. will be the first to agree with me that the planters should understand exactly what they are buying, and that the weak points of different fertilisers should be known to them and openly admitted by the sellers when they are weak points. In this instance I merely wish to warn the planter that if he is going to use Nitrate of Lime it must not be stored on the estate during the monsoon without special precautions.

RUDOLPH D. ANSTEAD,
Planting Expert.

Bangalore, 30th October, 1911.

Disinfection of Tea Seed.

Dear Sir,—I have read with interest your Scientific Officer's remarks as to the advisability of disinfecting all tea seed imported from Northern India.

It may interest you and the Planting members of your district to know that all seed despatched by my Company is disinfected immediately prior to packing with formalin.

For fear of contamination is one of the main reasons that all purchasers are strongly advised to have their seed packed in charcoal instead of sand or earth. . . .

I also notice that your Scientific Officer hopes to start experimental plots in your districts. Should he require any seed for this purpose I shall only be too glad to send him free of all charge an amount up to half a maund, (40 lbs.) on receiving advice from him or the Secretary of your Committee.

(Signed) A. B. POLPOYS,
Manager,
The Zaloni Tea Estates, Ltd.

October 24th, 1911.

A Venezuelan report states that Rubber and Balata form an important export. The Rubber is tapped from the wild tree, *Hevea brasiliensis.* Sernabi is a variety of inferior rubber, Balata, a gum resembling rubber, but less elastic and less valuable, comes from the *Mimusops globosa*, which grows wild all over Venezuela, but principally in the Guayana district.

PLANT DISEASES AND PESTS.

In issue of 14th October (Vol. VI, No. 41, p. 625) reference was made to legislative action contemplated in the United States with the object of regulating the importation of plants, &c., so as to check the importation and distribution of plant diseases and insect pests.

It was remarked then that the full text of the proposed Bill had not been received. This text has now come to hand, and a copy is given below.

The Bill now before the U. S. Congress reads as follows :—

A Bill to regulate the importation and interstate transportation of nursery stock, to enable the Secretary of Agriculture to establish and maintain quarantine districts for plant diseases and insect pests, to permit and regulate the movement of fruits, plants, and vegetables therefrom, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That it shall be unlawful for any person, firm or corporation to import or offer for entry into the United States from any foreign country any nursery stock unless and until a permit shall have been issued therefor by the Secretary of Agriculture, under such conditions and regulations as the said Secretary may prescribe, and unless such nursery stock shall be accompanied by a certificate of inspection in manner and form as required by the Secretary of Agriculture from the proper official of the country from which the importation is made to the effect that the stock has been inspected and found free from injurious plant diseases and insect pests : *Provided*, That this section shall not be construed as applying to plants or plant products for propagation : *Provided further* : That nursery stock may be imported for experimental or scientific purposes, without the certificate of inspection or the permit of the Secretary of Agriculture hereinbefore required, upon such conditions and under such regulations as the Secretary of Agriculture may prescribe : *And provided further*, That nursery stock imported from countries where no official system of inspection for such stock is maintained, may be admitted upon such conditions and under such regulations as the Secretary of Agriculture may prescribe.

Section 2.—That it shall be the duty of the Secretary of the Treasury promptly to notify the Secretary of Agriculture of the arrival of any nursery stock at ports of entry ; that the person, firm or corporation receiving such stock at port of entry, shall immediately upon entry and before such stock is delivered for shipment or removed from the port of entry, advise the Secretary of Agriculture or his agent designated for the purpose in the State to which such nursery stock is destined, as the Secretary of Agriculture may elect, of the name and address of the consignee, the nature and quantity of stock it is proposed to ship and the district and country where grown ; that no person, firm or corporation shall ship or offer for shipment to any common carrier, nor shall any common carrier transport or receive for transportation, any nursery stock imported into the United States from one State or Territory or the District of Columbia into another State or Territory or the District of Columbia without notifying the Secretary of Agriculture or his agent designated for the purpose in the State to which such nursery stock is destined, as the Secretary of Agriculture may elect, immediately upon the delivery of the said stock for shipment and before transportation is begun, of the name and address of the consignee, of the nature and quality of stock it is proposed to ship, and the country and district where same was grown.

Section 3.—That no person, firm, or corporation shall import or offer for entry into the United States any nursery stock unless the case, the box, package, crate, bale, or bundle thereof shall be plainly and correctly marked to show the nature and quantity of the contents, the country and district where the same was grown, the name and address of the shipper, owner, or person shipping or forwarding the same, and the name and address of the consignee.

Section 4.—That no person, firm, or corporation shall ship or deliver for shipment to any common carrier, nor shall any common carrier accept for transportation or transport from one State or Territory or the District of Columbia into another State or Territory or the District of Columbia, any nursery stock, the case, box, package, crate, bale, or bundle whereof is not plainly marked so as to show the nature and quantity of the contents, the name and address of the consignee, and the country or district where such stock was grown.

Section 5.—That the Secretary of Agriculture be, and he is hereby authorised to make such rules and regulations as may be necessary for carrying out the purposes of this Act.

Section 6.—That whenever, in order to prevent the introduction from any foreign country into the United States of any tree, plant or fruit, disease, or of any injurious insect, the Secretary of Agriculture shall determine that it is necessary to forbid the importation into the United States of nursery stock or of any class of fruits, vegetables, bulbs, plants, or seeds from a country where such disease or insect infection exists, he shall promulgate such determination, specifying the country and district, and the nursery stock or the class of fruits, vegetables, bulbs, plants, or seeds which, in his opinion, should be excluded, and, following the promulgation of such determination by the said Secretary and until the withdrawal of the said promulgation by him, the importation of nursery stock or of the class of fruits, vegetables, bulbs, plants or seeds specified in the said promulgation, from the country and district therein named, regardless of the use for which the same is intended, is hereby prohibited, and until the withdrawal of the said promulgation by the said Secretary, and notwithstanding that such nursery stock, fruits, vegetables, bulbs, plants or seeds be accompanied by a certificate of inspection from the country of importation, no person, firm, or corporation shall import or offer for entry into the United States from any foreign country specified in such promulgation any of the nursery stock or of the class of fruits, vegetables, bulbs, plants, or seeds named therein, regardless of the use for which the same is intended.

Section 7.—That the Secretary of Agriculture is authorised and directed to quarantine any State or Territory or the District of Columbia, or any portion thereof, when he shall determine the fact that a dangerous plant disease or insect infestation exist in such State, Territory or District of Columbia; and the said Secretary is directed to give notice of the establishment of such quarantine to common carriers doing business in or through such quarantined area, and shall publish in such newspapers in the quarantined area as he shall select notice of the establishment of quarantine; that no person, firm, or corporation shall ship or offer for shipment to any common carrier, nor shall any common carrier receive for transportation or transport, nor shall any person, firm, or corporation carry or transport from any quarantined State or Territory or the District of Columbia, or from the quarantined portion thereof, into or through any other State, or Territory or the District of Columbia, any nursery stock or any fruits, vegetables, bulbs, plants, or seeds, except as hereinafter provided;

that it shall be unlawful to move, or allow to be moved, any nursery stock, or any fruits, vegetables, bulbs, plants, or seeds specified in the notice of quarantine hereinafter provided, and regardless of the use for which the same is intended, from any quarantined State or Territory or the District of Columbia, or quarantined portion thereof into or through any other State or Territory or the District of Columbia, in manner or method or under conditions other than those prescribed by the Secretary of Agriculture; that it shall be the duty of the Secretary of Agriculture to make and promulgate rules and regulations which shall permit and govern the inspection, disinfection, certification, and method and manner of delivery and shipment of nursery stock, or any fruits, vegetables, bulbs, plants or seeds specified in the notice of quarntine hereinbefore provided, and regardless of the use for which the same is intended, from a quarantined State or Territory or the District of Columbia or quarantined portion thereof, into or through any other State or Territory or the District of Columbia; and the said Secretary shall give notice of such rules and regulations as hereinbefore provided in this section for the notice of the establishment of quarantine.

Section 8.—That whenever in this Act the term "nursery stock" is used it shall be construed as including field-grown florists' stock, trees, shrubs, vines, cuttings, grafts, scions, buds, fruit pits, seeds, or other plants or plant products for propagation, unless otherwise provided herein.

Section 9.—That any person, firm or corporation, who shall violate any of the provisions of this Act, or who shall forge, counterfeit, altar, deface, or destroy any certificate provided for in this Act or in the regulations of the Secretary of Agriculture, shall be deemed guilty of misdemeanor, and shall upon conviction thereof, be punished by a fine not exceeding five hundred dollars, or by imprisonment, or both such fine and imprisonment, in the discretion of the court, and it shall be the duty of the United States attorneys diligently to prosecute any violations of this Act which are brought to their attention by the Secretary of Agriculture or which come to their notice by other means.

Section 10.—That there is hereby appropriated, out of the moneys in the Treasury not otherwise appropriated, to be expended, as the Secretary of Agriculture may direct, for the purposes and objects of this Act, the sum of twenty five thousand dollars, which appropriation shall become available on nineteen hundred and .

Section 11.—That this Act shall become and be effective from and after the first day of July, nineteen hundred and twelve.

Indian Tea Prospects.

The *Grocer* of September 30, 1911, remarks:—The probable course of tea prices is being freely discussed, but while the statistical position remains as strong as at present, not much alteration in current values can be looked forward to with confidence. Common leaf, although somewhat cheaper than of late, remains exceptionally dear, being $1\frac{1}{2}d.$ per lb. higher than at this time last year. Should prices give way in the autumn it is considered in most quarters that the decline would not amount to much, as the world's requirements continue to expand steadily. Ceylon so far this year has shipped less freely than in 1910, partly owing to drought, and partly to the greater attention now given to rubber on the tea estates. Shipments from South India have also been, to some extent, retarded through the want of rain.

INSECTICIDES.

Recipes and Notes.

In Bulletin No. 23 of the Agricultural Research Institute, Pusa, very useful information is given concerning Insecticides, both the preparation and the manner of use being referred to. Before a selection of recipes and notes is given, it may be well to state that the Bulletin refers to the fact that all types from syringes with spraying nozzles at Rs.8, bucket sprayers at Rs.15, Knapsack sprayers at Rs.35 to large barrel machines for fruit trees are obtainable in India. Prices in Southern India appear to be higher, but there cannot be a doubt that if planters who want sprayers of any kind would work on co-operative lines when ordering them it would be possible to obtain supplies at about the prices quoted above.

It has been thought advisable to quote Notes in direct conjunction with the Recipes to which they relate, instead of giving them separately, at in the Pusa Bulletin.

RECIPE NO. 1.—LEAD CHROMATE.

Paste.—1½ lbs. in 30 to 60 gallons of water, or ¾ to 1½ oz. in one kerosene tin of water.

Powder.—1 lb. in 30 to 60 gallons of water or ½ to 1 oz. in one kerosene tin of water.

Home-made.—Dissolve 1 lb. of lead acetate or nitrate in the sprayer. Dissolve separately ½ lb. of powdered potassium bichromate and put into the sprayer. For a kerosene tin or Knapsack sprayer, use ½ oz. and ¼ oz. of the Lead Salt and bichromate respectively.

Keep well stirred and spray plants to be protected from insects.

RECIPE NO. 2.—NAPTHALIN EMULSION.

Dissolve 6 oz. concentrated size (*Sirish*) in ½ gallon of hot water, and add 1 lb. soft soap. Dissolve, in two gallons of kerosene, as much naphthalin as it will absorb; at ordinary temperatures about 2 lbs. 12 oz. is taken up; by warming carefully in the open over a small fire, 8 lbs. of naphthalin will dissolve. Add the naphthalin solution to the hot soft soap solution, add ½ gallon of water and churn or agitate with a syringe or sprayer.

Note.—Napthalin Emulsion is a temporary poison to caterpillars, grasshoppers, beetles and other insects eating plants. It is absolutely harmless unless the mixture is deliberately drunk. It is used for putting on to photograph and picture-mounts and to books to keep off fish insects. It can be used to destroy ants' nests in houses and is a very useful thing to have in the house. It can be made at home or bought ready-made.

RECIPE NO. 3.—BORDEAUX MIXTURE.

1 lb. Copper Sulphate (blue-stone).

11 oz. Quicklime.

4 gallons water.

Dissolve the powdered blue-stone in water; separately slake the quicklime in water, mix the two, make up to 4 gallons and pour into the sprayer through the strainer. A knife blade put into the solution should not acquire a brown deposit of copper: If it does, add more lime.

Note.—Copper Sulphate is the common blue-stone (tutia) procurable in all bazaars.

Recipe No. 4.—Crude Oil Emulsion.

For a sprayer or kerosene tin, stir or rub up half a pint of Emulsion in water, pour through the strainer and fill up with water. The quickest way to mix is to pump water on the emulsion in a kerosene tin from the sprayer or to put on the strainer and force it through by pumping a spray on it from the nozzle.

Note.—Crude Oil Emulsion.—Is the standard insecticide against all sucking insects, that is, insects which do not bite the leaves of plants but sit on them in crowds and suck the juice (Greenfly, Blackfly, Plant-lice, Mealy bug, Scale insects, etc.). It is also a splendid thing for dogs, if used like soap, as it kills ticks, fleas and lice. It heals sore places on animals and prevents flies laying eggs there or irritating the sores. It is first-rate for keeping off ants, for destroying their nests, for washing floors of rooms infested with fleas or other insects. Slowly dissolved in irrigation water, it checks white ants or other ants. It is harmless, can be easily mixed with water, makes no oily mess and is an absolute necessity in every Indian house. It is sold at Rs.6-4 per drum of five gallons or Re.1 per 2 lb. tin.

Vermisapon is an excellent all-round contact poison, requiring only to be mixed with cold water and used at the same strength as Crude Oil Emulsion, for which it is an excellent substitute.

Recipe No. 5.—Rosin Compound.

Powder 2 lbs. of rosin; boil a gallon of water with 1 lb. of washing soda crystals or 12 oz. of monohydrated soda. Add the powdered rosin to the boiling soda solution and continue boiling, adding cold water at intervals as it boils up till the liquid comes quite clear and thin, like clear coffee. It will amount to about three gallons. For normal solution, pour 4 pints of this into the sprayer or a kerosene tin and fill up with water to 4 gallons; for strong solution add 6 or 7 pints.

Note.—Rosin.—Common fir-tree rosin is required. It costs about three annas a pound retail; two annas wholesale.

Soda.—Ordinary washing soda is procurable everywhere. If much is to be used it is best to buy "monohydrated soda" costing 1½ annas a pound in small quantities, seven rupees a cwt.

Recipe No. 6.—Sanitary Fluid.

Under this name are classed all the forms of phenyl, Crude Carbolic and Creosote emulsions used as disinfectants. They mix with water and are good contact poisons at a third to half a pint to 4 gallons of water. We recommend them chiefly as they are available in all bazaars.

Note.—Sanitary Fluid is a mixture of Crude Creosote and rosin soap; it should mix with water to an emulsion or milky fluid. There are many brands of crude phenyls, disinfecting fluid, etc., all of which are suitable if they mix with water. They are not so safe to use on delicate plants as Crude Oil Emulsion.

Recipe No. 7.—Soap.

Common bar soap can be used if there is nothing else available. One pound to the gallon is the usual strength. For watering lawns 1 lb. to 15 gallons is used.

Recipe No. 8.—Surface Caterpillar Bait.

Dissolve a *chittack* of white arsenic and two *chittacks* of crude sugar (gur or jaggery) in two seers of water and mix thoroughly with 2½ seers of *choka* (bran, not chopped straw). Put this down in small handfuls.

Note.—Arsenic.—White arsenic (Sambul) is meant. It is a deadly poison. It is commonly procurable.

RECIPE No. 9.—BOOK SOLUTION.

1 Pint Methylated Spirit.

½ oz. Corrosive Sublimate.

½ oz. Carbolic acid.

These are mixed and dissolved. Paint on with a brush; the liquid is poisonous and should not touch the fingers. Naphthalin emulsion is as imperfect substitute.

Note.—Book solution is a deadly poison; a single application once a year to books is sufficient. Can be bought ready-made or can be made up by any chemist.

RECIPE No. 10.—WHITE ANT SOLUTION.

1 oz. White arsenic

4 oz. Washing soda.

1 quart water.

Boil till the arsenic dissolves. Make up to 4 gallons with water. Macdougal's Weed Killer is an excellent substitute.

Note.—See Notes to Recipes 5 and 8.

RECIPE No. 11.—MOSQUITO OIL.

To equal parts of kerosene and Cocoanut Oil add sufficient Citronella Oil to give the mixture a distinct smell of Citronella. A few drops of Carbolic Acid may also be added (this is not necessary). This mixture is cheaper than pure Cintronella Oil, is equally effective in repelling mosquitos, does not nitrate the skin, and one application will last for 6-8 hours, whereas Citronella evaporates in about half-an hour.

Note.—Citronella oil is obtainable from chemists and forms the basis of most mosquito lotions. We believe a little pure oil is cheaper and better than a mosquito lotion, which may not contain citronella at all and may become very wearisome if used often.

RECIPE No. 12.—ANT TAPE.

A solution of corrosive sublimate is prepared by heating the sublimate and water in a *porcelain* or *granite ware* vessel until the maximum amount is dissolved. This solution is allowed to cool, then filtered, and ordinary cotton cloth or tape soaked in the filtrate for several hours, then removed and hung up to dry, after which it is ready for use. It is very important that no iron, tin or steel come in contact with the solution or the tape itself after being made. The tape or cloth is tacked or tied around the legs of tables, along edges of shelves, etc., and ants will not cross it. It will thus successfully repel ants for some months before being renewed.

The exports of coffee from Venezuela in 1909-10 were poor. The crop for 1910-11 was expected to be an exceptionally good one. The exports of coffee from Venezuela amount to from 35 to 50 per cent. of the total exports, hence it will be readily understood that the coffee crop and the price of coffee are by far the most important factors in determining the prosperity or otherwise of the country. In the event of the hopes for a record crop being fulfilled and should prices remain at their present high level, a period of relative prosperity may be expected, and every class of business will show a tendency to greater briskness.

COFFEE.

In Abyssinia.

H. B. M. Consul in Abyssinia reports:—Coffee is of two main divisions —the Harrari, grown in coffee plantations near Harrar, and the Abyssinian, which grows wild for the most part in Southern and Western Abyssinia.

The Harrari, a fine yellow berry, is mixed with Mocha in Aden and sold as long berry Mocha in the United Kingdom and America. Its price in Harrar is about 8 dollars per farasula, including brokerage, handling, &c. Transport to Dire Dawa is 27 fr. the 100 kilos., rail Jibuti 84 fr., sea to Aden 19 fr.

Abyssinian coffee is of several sorts, according to locality. The Sudan Government sent samples to London to be valued, and the coffee brokers criticised the picking and presentation as largely responsible for the poor prices. At Gore efforts are being made to remedy these matters, but even at its present level it seems that Abyssinian selected coffee can be sold in London at a profit. When once a wider market is thus established the trade may look for extension.

At present the market from Jibuti (a diminishing one) is Aden, and from Gambeila, Khartoum, where the price is about £2·200 per kanter (99 lbs.).

This leaves a handsome profit, as the following calculation (on Mr. Walker's figures) will show:—

	Per Kantar. £E.
Gore market price, average 3½ dol.	·840
Mule to Bure, 2 dol. per 6 farasulas (2¼ Kantars) ...	·080
Abyssinian customs, 10 per cent. (valuation 3 dal. per farasula ⅜ Kantar)	·072
Porterage, Gambeila, 1 dol. per farasula ...	·320
Sudan customs, 6 per cent.	·078
Loading steamer, Sacks, &c.	·040
Freight to Khartoum	·200
Loss by dirt, &c., 5 per cent.	·073
Total	1·703
Price in Omdurman ...	2·200
Profit (about 29 per cent.) ...	·497

In these figures I have purposely taken a very high average for Gore price and a high average for porterage. Gore prices are seldom over 3½ dol., and it is hoped some reduction of porterage may be possible.

About one-third of the coffee sold in Khartoum comes from Abyssinia, value roughly £15,000.

An interesting insurance against loss by fluctuations in the price of coffee appears to have been effected by the principal buyers of this year's crop with a French Company. The level of price, below which compensation was to be paid was 70 fr. a kantar, considerably more than the Omdurman price quoted above.

Brazilian Coffee.

Mr. Vice-Consul Sandall reports as follows on the Trade of Santos for the year:—

In 1910, 6,618,392 bags of coffee were exported less than in 1909, the decrease in the value of the coffee exported in 1910 as compared with 1909 being 8,263,164 bags.

The 6,834,712 bags of coffee exported in 1910 were practically all shipped during the second half of the year, the additional export tax of 20 per cent. *ad valorem* which was imposed on December 12, 1909 and remained in force up to June 30, having prevented the shipment up to that date of any coffee but a few lots in transit from the neighbouring State of Minas Geraes.

The export limit for the 1910-11 crop being 10,000,000 bags, excluding Minas coffee, estimated at some 500,000 bags, or 10,500,000 bags in all, there was, fortunately for all concerned, no necessity for rushing supplies to market as in 1909, seeing that in view of the crop being generally estimated at 8,500,000 bags, there was no fear of the above mentioned limit of 10,500,000 bags being reached.

In view of the intervention of the Sao Paulo State Government having played such an important part in the enhancement of the value of coffee, a recapitulation of the measures adopted and operations effected in connection with the valorisation plan will be of interest.

In December, 1905, the special export gold tax of 3 fr. per bag was imposed. Purchases of coffee for account of the State Government commenced in 1906. On August 1 of that year a loan of 1,000,000 fr. was raised, on December 8, 1907, a further 3,000,000 fr. and on January 17, 1908, still another 3,000,000 fr.

In the beginning of 1908, a law was passed limiting exports of coffee produced in the State of Sao Paulo to—

Crop—	Bags.
1908-09	9,000,000
1909-10	9,500,000
1910-11 and onwards... ...	10,000,000

The limitation was to be effected by means of a practically prohibitive export tax of 20 per cent. *ad valorem*, to come into force in each crop year as soon as the respective limit should be reached.

On December 11 a loan of 15,000,000, guaranteed by the Federal Government, was raised, by the terms of which it was agreed to liquidate the Government holdings in the following manner:—

To be sold during crop year—	Bags.
1909-10...	500,000
1910-11...	600,000
1911-12...	700,000

and so on, or more on a basis of not less than 47 fr. per 50 kilos. for good average and 50 fr. per 50 kilos. for superior (Havre exchange type). . . .

The Santos Chamber of Commerce has published an estimate of 9,650,000 bags, for the 1911-12 crop, but the general opinion appears to be that entries will reach at least 11,000,000 bags.

The actual crop may even exceed this figure, but the limitation of the quantity to be exported may keep back supplies to some extent, as once the limit is reached well-to-do farmers will have no object in sending down their coffee before the withdrawal of 20 per cent. tax at the commencement of the next crop.

RUBBER.

A New System of Tapping.

In the course of a letter to the *Times of Ceylon*, Mr. J. Sheridan Patterson remarks :—

In dividing the young tree directly into fourths, or even into thirds, I found the strip of bark available for tapping too small on a tree 18 inches in girth at three feet from the ground, so I devised the method which I attempted to describe in my letter. Briefly the system was to take any tree of 18 in., or even 16 in. in girth at 3 feet, and to divide it into half, and then with two or three cuts at a foot apart to tap out this section, which should take twelve months. At the completion of the twelve months, the tree would have increased in girth and be from 22 in. to 24 inches at 3 feet from the ground. I then proposed taking another 2 or 3 cuts above the previous cuts and carrying on for another twelve months, by which time the tree would have increased, a further four to six inches. My idea then was to take $\frac{2}{3}$ of the untapped half and mark it out from the bottom with two or three cuts as before, and tap it out, and when this was completed go up above these cuts with another two or three cuts again. The tree would then have been tapped four years and still have an untapped section. The fourth year's tapping would then be over this untapped section (which is the third of the second half of the tree of which $\frac{2}{3}$ is tapped out) and over one-third of the originally tapped half, the tree then being divided into $\frac{1}{3}$ for evermore.

The practical adaptation of this system has shown that it works out well, but it is found better only to put two cuts on the first half, then when this is tapped out to divide the other half of the tree into $\frac{2}{3}$ and put two or three cuts on this $\frac{2}{3}$ section, giving another year's work. When this is completed, say in twelve months' time, if the renewed bark of the first year's tapping is sufficiently good, the $\frac{1}{3}$ of the second half that is intact, and $\frac{1}{3}$ of the first year's section, can be taken straight away and the tree is divided into thirds. But if, as is most probable, the renewal of the first section tapped is not considered sufficiently recovered then put on two or three cuts above the second year's tapping and carry on for another twelve months, by when the first section tapped will be good enough in almost all cases to have $\frac{1}{3}$ of its area taken in and the $\frac{2}{3}$ left will be sufficiently renewed to perform all the necessary functions of the bark, which necessity is being so entirely ignored by many systems of tapping now in vogue which take half of the tree one year and half the next, and so on. Once the tree is got into sections of three, which will, I think, generally prove to be in three years in the best districts, and four years where bark is thinner (or at higher elevations, or in dry zones) the $\frac{1}{3}$ section will be tapped each year, so that there will always be on the tree a strip of bark of not less than one-third of its circumference, which is at least two year old renewal, and the system is elastic, because never more than 3 cuts will be put on at a time so that at any time a section can be gone above for another year, making the other sections a year older. The system, therefore, has the advantage of enabling a young tree to be profitably tapped when 16 in. to 18 in. in girth at three feet from the ground, and it adapts itself to any district or elevation, and the period of renewal can be extended from 3 years to 6 years as desired. That the tapping above after the first or second year makes no reduction in yield is proved by yields secured from fields where the system is in vogue. It even appears that the leaving of the untapped section increases the yield and in any case it must prove beneficial to the tree.

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(INCORPORATED.)

Labour Committee.

It will be remembered that at the last Annual Meeting a resolution was adopted appointing the delegate from Kanan Devan and the delegate from the Anamalais, a Committee for the purpose of trying to come to an understanding about the Labour problem.

Mr. Aylmer Martin, the Kanan Devan delegate, has since resigned. In these circumstances the Anamalai Planters' Association is at a loss to know how to act. The Honorary Secretary writes :—" I conclude that the Committee in question must fall through. I should like to point out that in any case little good seemed likely to arrive from the discussion, as the opinions of this Association are so diametrically opposed to those held by Mr. Martin. I think our delegate expressed our views very well in a speech made by him at the last meeting and as far as I know nothing has transpired since to make us modify these views. At the same time we should have been most pleased to have met Mr. Martin to try and arrange some scheme acceptable to all parties and were quite ready to modify our ideas if some satisfactory scheme could have been arranged."

Green Manures.

Small lots of *Tephrosia purpurea* and *Indigofera tinctoria* seed—about 150 lbs. of each—are now available, and planters who require supplies are requested to send their orders to the Secretary as soon as possible.

There is no certainty yet that larger supplies will be obtainable this season at reasonable process ; but inquiries on the subject are still being made.

Sprayers.

Messrs. Peirce, Leslie & Co., Ld., of Calicut, write :—" Whoever was responsible for the introductory remarks to the interesting article on the subject of Insecticides on page 683 of your issue of November the 4th, condemned the prices charged in Southern India for Sprayers rather too hurriedly. Had he seen a copy of our quarterly Price List, which as far as possible we circulate among all those interested in the planting industry, he would have seen that Knapsack Sprayers can also be purchased in Southern India at Rs.35."

The writer of the comments referred to acknowledges that he had not seen the quarterly price list referred to. He had perused some earlier lists, issued by the same Firm, but these contained no allusion to Sprayers or their prices.

Scientific Officer's Papers.

LXXXII.—Manurial Experiments with Hevea Rubber.

A Series of experiments have been carried out during the year in Mundakayam with the object of testing the effect of easily soluble and quick acting fertilisers upon the yield of latex and rubber from Hevea in distinction to the effect of fertilisers upon the growth of the trees. A worse season than that experienced could hardly have been chosen for any experiments, the rainfall having been abnormally heavy, as shown by the following figures :—

April	... ...	3'12 inches.
May	... ...	14'93 ,,
June	... ...	59'00 ,,
July	... ...	46'29 ,,
August (1 to 18)	...	5'14 ,,

This extraordinarily heavy rainfall, especially during June and July, must have greatly affected the experiments and very largely vitiated the results obtained. These results are published, however, for what they may be worth, as a record of what has been done, and in the hope that they may encourage others to carry out similar experiments, or repeat the same ones.

A block of 400, 5½ year old trees planted 10 by 20, or 218 to the acre, was chosen on a poor ridge which needed cultivation and manure. All the trees were of fairly even growth. This block was divided into four sections each consisting of 100 trees. These sections were forked and manured from 18 to 22 April 1911, and treated as follows :—

Section A was given Sulphate of Ammonia at the rate of ½ lb. per tree.
Section B was given Nitrate of Soda at the rate of ½ lb. per tree.
Section C was given Saltpetre at the rate of ½ lb. per tree.
Section D was given no manure but cultivated only.

Tapping was begun on 25th April on the ordinary left to right half herringbone system, the cuts going one third of the way round the tree. By the end of June all the trees were giving about the same yield, so the experiment was closed. The results obtained, with other particulars, will be found in the following table :—

Section.	Manurial Treatment.	Average Girth in inches 3 feet from the ground.		Number of days tapped	No. of cuts.	Yield of Wet Rubber.		
		24 April.	15 Aug.			Scrap lbs. oz.	Sheet lbs. oz.	Total lbs. oz.
A 100 trees.	Sulphate of Ammonia ½ lb. per tree.	16'19	18'6	34	296	8'2½	36'4½	44'7
B 100 trees.	Nitrate of Soda ½ lb. per tree.	16'06	17.37	33	287	7'14½	35'10½	43'9
C 100 trees.	Saltpetre ½ lb. per tree.	16'86	17'59	31	296	6'9¾	30'13	37'6¾
D 100 trees.	Unmanured.	15'7	17'16	32	271	7'7½	29'13	37'4½

The greatest increase in yield is apparently produced by Sulphate of Ammonia and it amounted to 7lbs. 2½ ounces of wet rubber in all, which barely reaches the 10% difference each way that Hall insists upon as being necessary to eliminate experimental error in field experiments.

The cost of applying the manures, including the forking, amounted to Rs.1-8 per 100 trees. The cost of the manures delivered on this particular estate was as follows:—

50 lbs. Sulphate of Ammonia	Rs.	6	5	4
50 lbs. Nitrate of Soda	,,	5	14	8
50 lbs. Saltpetre	,,	5	8	0

Sheet rubber may be valued at about Rs.3-12 per pound and Scrap rubber at about Rs.2-13 per pound, while to convert the yields of wet rubber into dry rubber the weights have been halved, that is, two pounds of wet rubber have been considered equivalent to one pound of dry rubber.

The monetary aspect of the experiment, based on these figures, is shown in the following table:—

Section.	Cost of manure and its application.	Increased yield over unmanured section in dry rubber.			Value of Increased yield over unmanured section.			Profit per 100 trees.
		Sheet	Scrap	Total	Sheet	Scrap	Total	
	RS. A. P.	lbs. oz.	lbs. oz.	lbs. oz.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
A. Sulphate of Ammonia.	7-13-4	3·3¾	0·5½	3·9¼	12-2-1	0-15-5	13-1-6	5--4--2
B. Nitrate of Soda.	7-6-8	2·14¼	0·3½	3·1¾	10-13-5	0-9-10	11-7-3	4--0--7

With 218 trees to the acre manuring with Sulphate of Ammonia works out at a profit of about Rs.11-8 per acre even under the unfavourable conditions already remarked upon.

Saltpetre shows a loss instead of a gain, yet the manager of the Estate on which these experiments were conducted says in his report, "Personally I was most impressed by the steady progress made by the trees treated with Saltpetre." Hence, though this fertiliser does not increase the yield of rubber, it evidently improves the general health of the tree.

In considering the results given above several points must be borne in mind. First of all they have been obtained from one series of experiments only and not checked or confirmed in any way, and secondly there can be little doubt that much of the fertilisers applied must have been washed away by the heavy rain before the trees could benefit from them. This would be the case more especially with the Nitrate of Soda, and the Nitrate part of Saltpetre, while the Sulphate of Ammonia would hardly have become nitrified and fully effective by the time tapping began. I do not think that any conclusions can be definitely drawn from the results, but they are of great interest I think as showing what fertilisers may be expected to do, and they are well worth repeating under more favourable circumstances, while a large series of similar experiments on different estates throughout the district should undoubtedly be based upon them. In any future experiment it would

be advisable to Lime the section which is to receive Sulphate of Ammonia about a month before the latter is applied, in order that the full benefit may be obtained from it.

I trust that the Mundakayam Rubber Planters' Association will take the matter up and have such a series carried out. If that were done systematically, so that a dozen plots could be compared, valuable information could be gained. For instance, if Sulphate of Ammonia headed the list in all the plots out of a dozen experiments at different places we should be able to say definitely that it was the right fertiliser to apply to Hevea Rubber to increase the yield of the rubber.

My sincere thanks, and those all of Rubber planters, are due to the manager of the estate on which these experiments were conducted for the trouble which he has taken about them, and the careful way in which they were carried out. My suggestions were most carefully followed out and the detailed figures with which he has supplied me, showing the yield obtained each day, have been most accurately kept. The results given in this report are totalled, but each day's figures are avilable should any one care to see them.

RUDOLPH D. ANSTEAD,
Planting Expert.

The Coffee Trade.

A steady upward movement has recently been going on in values of coffee, says the *Grocer* of October 7. 1911, but a fairly good trade has been done, notwithstanding the abnormally high prices, now ruling. Only small supplies are now available and the scarcity of fine coffee is striking. The lower qualities receive the chief share of attention, although dear in comparison. The consumption of coffee in the principal consuming contries of the world is adversely affected by the continuance of prices at a level much above the normal. The present time would be favourable for holding further sales of the valorisation coffee, but the holders have arranged to sell no more this year, although the current value would yield a handsome profit. Total visible supplies have increased by 932,000 bags during the past month, yet there is a scarcity of coffee in Europe, while in Santos stocks there have lately been increases.

Judged by the strength recently exhibited by the Santos market, it is evident that an unfavourable view is entertained by people there as to crop prospects. The present crop is reported not to come up to previous estimates, while the outlook for the coming crop has not improved owing to unfavourable weather conditions. Varying crop reports are likely to be circulated, causing sharp fluctuations in terminal markets, such as that lately experienced. For a long time the trade has been working on very small stocks, and since it has been necessary to replenish some buyers have found that holders have required the extreme currency.

——:o:——

The Government Coffee plantations in the Congo State cover an area of 1,483 acres, and are situated principally in the Equator district. These plantations have been in existence for some years, but their output has diminished to such a degree that the Government were undecided whether or not to continue their maintenance, as well as that of the factory at Kinshasa for cleaning and drying the beans. Acting upon expert advice, the Government have decided to continue the industry on improved lines, calculated to reduce the cost of transport and render the industry more productive.

SECRETARY'S PAPERS.

II.- Decrease of Coffee Consumption in the United States.

In the first of this series of papers allusion was made to the stimulus given by the Coffee Valorization scheme to the consumption of "Coffee substitutes."

Just after that paper was written, and before it was published, the writer received a totally unexpected letter from a friend in Canada, one known to many planters in Southern India, whose name is only withheld because, while advising action, he has not authorised publication of his name.

Sending a specimen of a "Postum" advertisement in a Canadian paper, this gentleman writes as follows:—

"The enclosed is a sample of the advertisements frequently met with. Is the U. P. A. S. I. going to let that go on unchecked? This 'Postum,' or something very like it, is not only sold all over the U. S. A. and Canada but also in Europe. I met with it in Germany before I went out to India. But it is only recently that I have noticed these slanderous advertisements against coffee. The manufacturers of 'Postum' must make a great profit, for it is sold retail for about ten times as much as the cost of manufacture would, in my opinion, warrant. The success 'Postum' is having indicates the power of advertisement. 'Postum' is now, I believe, manufactured in a number of places by the same company. Originally it came, if I am not mistaken, from the Battle Creek sanatorium in Michigan, U. S. A., of which a certain Dr. Kellog was the head. Personally I think the U. P. A. ought to do all in their power to check the growth of this trade. 'Postum' does, I believe, more damage to coffee than tea."

Curiously enough, the above letter followed a stirring circular that had come to hand a few days earlier from the United States. This had been put aside for use in the present paper, for in it Mr. Frank C. Marshall may be said to "point a moral and adorn a tale." At any rate, the following extracts are worth reading:—

"The coffee world is discussing what is to be the future of coffee as the result of the campaign of miseducation carried on by the coffee substitute people. We have before us a letter from one of the largest roasters in the South asking what can be done to counteract the work of the enemies of coffee. The matter should have been taken up and a fight made by the Brazilian Government when they were completing their beautiful valorization scheme.

"In the writer's opinion these substitutes are slop. He tried a cup of the concoction put out by the largest concern in the substitute line after a good dinner, and gave up the dinner. While these substitutes are vile, in our opinion, there are enormous profits in the business. Millions of dollars worth of them have been sold, and as the stock costs but little it is safe to say that for every million dollars worth sold there was a profit of three-quarters of a million for advertising.

"The advertising is carried along the lines of the patent medicine business. Most students studying medicine during their first year imagine they have every disease they read about, and we all know the joy with which every delicate person reads a new patent medicine advertisement, and herein lay the opportunity of the substitute man. Every case of indigestion, rheumatism, gout, appendicitis, broken leg or fractured skull was attributed to coffee. Of course, it is idiotic, but the dope has appealed to every old dyspeptic and hypochondriac in the country, making every one of them a disciple of the substitute man.

"Results, where a few years ago everybody drank coffee, several cups per day, we find in every walk of life people who imagine they cannot drink it; burly blacksmiths, carpenters, labourers and athletes have discontinued or cut down the use of coffee. A case came under our notice of a well-to-do, intelligent man, weighing 350 pounds, who can and does eat a beefsteak large enough for four people, with potatoes, salads and deserts, with a quart or two of champagne, all at one meal, who almost paralyzed the writer by saying he could not drink one cup of coffee during the day and sleep that night. He had read the substitute advertisements. As there is not a person who reads this and will not be able to find the same conditions existing among his own circle of acquaintances, is it not well for the Brazilians to sit up and take notice?"

Mr. Marshall cites figures to prove that notwithstanding the enormous increase in population during the last three years coffee shows "an appalling decrease" in consumption. He then remarks:—

"The consumption of coffee last year was only 17,663,000 bags, so that as no one disputes a heavy decrease in consumption thus far this crop year, without counting cereals, etc., which will run at least 1,000,000 bags, the crop of 1911-1912 is sure to run far above requirements, even if the wildest dream estimate of the craziest bull is accepted. . . . .

"Leaving out of consideration the 17,000,000 bags conceded by the lowest estimates, there is enough coffee to run about eight months if we did not use one bag of the present crop. History shows that if this condition obtained in any other stable product, say, wheat, this article would sell under 50 cents. With a reserve of less than two months' supply wheat declined from $1.25 per bushel to around 90 cents, and wheat is necessary to mankind. We are being shown that coffee is not.

"Year after year coffee options have gone begging at under 4 cents and will do again. It is up to the Brazilian Government to come forward with all those valorization millions to counteract the work of the enemies of coffee, and to pacify the outraged consumer, and it may be said that the valorization scheme is a personal matter with every coffee consumer in the land, and the feeling is very bitter."

So far as America is concerned the sale of "coffee substitutes" does not affect Indian Coffee *directly*, for practically none of this is sold there. Yet, every pound of Coffee—from any country—that is ousted from the American market by "Postum" or other "cereal foods" has to find a sale elsewhere. Hence, whenever these "coffee substitutes" are taken instead of coffee, demand for the latter is diminished. Moreover, as pointed out above, these "breakfast foods" are not sold in America alone; they are being vigorously advertised also in parts of Europe. In some places they must come into direct rivalry with South Indian Coffee. Knowing that this rivalry is not confined to fair commercial competition, ought planters in Southern India to remain quiet and let their rivals realise many times the cost of the products offered to consumers, when these profits are partly gained by misrepresentation? The U. P. A. S. I. has made a strong fight against Adulteration of Coffee. What about this Calumniation of Coffee which urges a change to "Postum" and insinuates, while stopping short of asserting, that this change will bring "clearer brain, steadier nerves and better digestion?"

The writer's Canadian friend appeals to the U. P. A. S. I., Mr. Frank C. Marshall to the Brazilians. But the two appeals are alike in substance, and both are impressive.

DISTRICT PLANTERS' ASSOCIATIONS.

Mundakayam Rubber Planters' Association.

Minutes of a General Meeting held at Kadamancolam Bungalow, on Saturday, the 7th October, 1911.

PRESENT.—Messrs. R. Harley (Chairman), K. E. Nicoll, G. H. Danvers Davy, E. Wilson, W. A. Asher, F. E. Vernede, A. Hamond, M. Smith, E. R. Gudgeon, C. L. Egan, C. B. Hall, E. E. Eyre, J. Wedderspoon, R. T. Redmayne, G. West, N. B. Hartley, F. H. Hall and A. C. Vincent.

The Minutes of last Meeting were taken as read.

Scientific Officer Scheme.—The Chairman observed that this scheme should be put through as quickly as possible, so that Messrs. J. A. Richardson and J. J. Murphy could select a suitable officer in England.

Post Office at Erutthapetta, &c.—Read letter from the Postmaster-General stating that it had been decided to drop the proposal to open a combined office at Palai. Mr. Asher stated that Teekoy Estate will only support a proposal to establish a Telegraph Office at Erutthapetta and not at Palai, and that the Estate is still open to guarantee an annual payment of Rs.300 for 5 years towards any loss which might be sustained by the Telegraph Department during that period. Resolved: "That the Honorary Secretary be instructed to again address the Postmaster-General on the matter."

Roads.—The Chairman stated that the Government had informed him that they are not prepared to subscribe anything towards the up.keep of the Kuppakayam Road. It was suggested by Mr. Hamon that a toll should be levied on elephants drawing timber over the road.

Lalam Erutthapetta Road.—Mr. Asher stated that this road is still in a very bad condition, and it was resolved: "That the Hon. Secretary be instructed to write to the Dewan stating that the bridges on this road are breaking up, that no improvements have been made, and that the money granted by Government for repairs does not appear to have been spent." It was also resolved to send Government a reminder as to the Kutikul Poonyar Road.

Wharf charges at Kottayam.—Resolved to address the Town Improvement Council at Kottayam on this matter, and to ask them what their scheme is in connection with the charges.

Mundakayam Rest House.—Proposed by Mr. Hamond, seconded by Mr. Hall, and resolved: "That the attention of the Engineer of the D. P. W. be draw to the undesirability of the present Butler."

Police Station.—The Honorary Secretary was instructed to ask Government to make Mundakayam a charging station.

Malabar Commercial Crop, Ltd.—Read letter regarding charges for hire of Motor car, also correspondence between the Corporation and Mr. Kirk. Proposed by Mr. Davy, seconded by Mr. Harley, and resolved: That a fixed rate should be made for empty cars returning.

Labour.—Read circular from U.P.A.S.I. with reference to emigration.

Rice Measures.—Proposed by Mr. Vernede, seconded by Mr. Hamond, and resolved: "That a uniform measure be used by all estates in the district on the basis of the *edinglee* used by the chief merchants in Mundakayam.

A vote of thanks was given to Mr F. H. Hall for his services as Secretary, and Mr. A. C. Vincent was elected to continue the work for the remainder of the year.

(Signed) R. HARLEY,
Chairman.

(,,) A. C. VINCENT,
Acting Hon. Secretary.

Central Travancore Planters' Association.

Minutes of the Third Quarterly Meeting of the above Association held at Carady Goody Bungalow, on Saturday, the 14th October, 1911, at 10 a.m.

PRESENT.—Messrs. W. R. G. Leahy (Chairman), F. Bissett (Vice-Chairman), J. F. Fraser, K. E. Nicoll, C. W. Lacey, W. G. Haslam, F. E. Thomas, T. A. Kinmond, J. H. Cantlay, J. H. Ellis, C. C. Evans, H. C. Westaway, F. W. Winterbotham, Dr. Lindsay, and J. S. Wilkie (Honorary Secretary).

The Notice calling the Meeting was read.

The Minutes of the previous Meeting were taken as read and confirmed.

Correspondence.—Read letter from Mr. Aylmer Martin, also advertisement which it is proposed to circulate through the labour centres, &c.

The Honorary Secretary was instructed to send up a few suggestions and to apply for 5,000 copies in Tamil and 1,500 in Malayalam.

Read letter from the Secretary, U.P.A.S.I., dated 9th September. The question of new year's finance was brought up and the Honorary Secretary was instructed to ask for an Estimate.

Read letters from the Secretary, U.P.A.S.I., 57/11 to 61/11. The feeling of the Meeting was that sectional meetings were not necessary.

Read letter No. 63/11. The Meeting approved of Mr. R. D. Anstead serving on the Committee appointed to consider measures to guard against the introduction of insect pests.

District Roads.—Proposed by Mr. H. C. Westaway and seconded by Mr. K. E. Nicoll: "That the Chief Engineer again be asked to reconsider the application for Rs.500 as resolved at a Meeting of the Association held on 15th July for the up-keep and repairs of the Hope-Stagbrook private cart road, as Stagbrook Estate has spent Rs.486-5-4 for the up-keep during the current year owing to the non-completion of the 2nd mile bridge pointed out in the previous above quoted resolution, and had this road not been available the whole west end of the District traffic would have been stopped.

It was decided that should Government not defray the expenses of the up-keep of this Stagbrook private road the Estates participating agree to pay their share calculated on an acreage basis.

Read letters from the Chief Engineer, Nos. 925 and 1246.

Resolved: That the proposed agreement for the contract on the Glenmary and C. H. Road be circulated for the approval of those interested.

Medical Scheme.—The Honorary Secretary reported that the trust deed had not yet come forward; it was decided that this be cabled for.

Dr. Lindsay and Mr. Robinson were made Honorary Members of the Association.

Labour Rules.—Proposed by Mr. Kinmond and seconded by Mr. Lacey: "That the present labour rules be abolished and the old Tundu system be reverted to. If arbitration be deemed necessary a committee of three members (one of whom to be the Chairman) be elected. In the event of this resolution being passed that non-members of the Association be asked to support same."

Mr. Westway proposed as an amendment: "That the present Rules be continued." Seconded by Mr. K. E. Nicoll.

On being put to the vote the amendment was carried by a majority of one vote.

Proposed by Mr. Kinmond and seconded by Mr. Fraser: "That the Honorary Secretary be asked to find out number of horses and head of cattle in the District, with the view of assisting us to obtain a Veterinary Hospital in the District."

Proposed by Mr. Fraser and seconded by Mr. Bissett: "That Government be requested to grant a liquor license to the Kottayam Trading Company for their Fairfield shop."

Proposed Mr. K. E. Nicoll and seconded by Mr. T. A. Kinmond: "That all applications for land by native squatters on Estate boundaries should go through the Superintendent, Cardamom Hills, and not through petty native officials, as the granting of land recently to squatters on Estate boundaries is becoming a serious matter."

The Meeting asked Mr. K. E. Nicoll when in Trivandrum to inquire into the matter of the raising of price of grass land to Rs.25 per acre.

Bangalore Delegate's Report.—I attended the U. P. S. A. I. meeting with instructions to support resolutions in favour of the Cumbum Valley Railway, Prevention of thefts of tea and rubber, Re-introduction of bonus on green tea, and to ask for information as to the health of coolies in the Straits.

Instructions were also given me to oppose the proposed 8 annas for the Scientific Department and to try and arrange for Mr. Anstead to visit the District in April or the beginning of May.

The question of Vaigai Valley known to us as the Cumbum Valley Railway was brought up at last year's meeting at Bangalore by the delegate from the Kanan Devan Hills Planters' Association, and he again brought up the subject this year. From the annual report of the Secretary to the U.P.A.S.I. you will see that the Madura District Board could do nothing until the terms of the revised contract with the South Indian Railway were settled. Mr. Martin said that he had either heard or read that the contract was completed, so last year's resolution was re-affirmed. Later in the Meeting, however, in reply to a wire from the Secretary, it turned out that this was not the case. We shall probably hear what the Madura District Board propose doing about the railway at their next meeting.

Thefts of tea was a subject which I was unable to bring forward, as there is an understanding that every effort should be made by the District Association to obtain redress from the local Government before a complaint of this kind is brought before the U.P. Association and as far as I know the Travancore Government have not refused to help us.

The Delegate from the Wynaad Association proposed a resolution in favour of a bonus on green tea and the Delegate from the Nilgiris brought forward an amendment opposing it. Though the amendment was lost, I think the fact of our not being unanimous will prevent our representative

persuading the Tea Cess Committee that the bonus is necessary. Mr Jackson, of the Madras Chamber of Commerce, has retired and Mr. Carson Parker taken his place on the Tea Cess Committee.*

Labour we found a very big subject, and I think everyone at the meeting had complaints of one sort or another. Mr. Martin suggested in Committee that each planting District should circulate a poster similar to the one used by the Ceylon Labour Commission in the villages in Southern India, the circular to be printed as coming from the U. P. A. S. I.

Mysore naturally complained when the Ceylon Labour Commission opened an Agency within sight of some of the Coffee Estates. After the Meeting was over I heard orders had been given to have the Agency closed. They (Mysore) also complained of coolies being crimped by Travancore and suggested that labour rules similar to those now in force in this District should be used throughout the Planting Districts of South India.

There is a chance that these rules may be of some use, as any flagrant case of crimping can be brought before the U. P. A. S. I. at the Annual Meetings.

The discussion on labour ended in a committee, Messrs. Barber and Martin being appointed to "consider" the labour problem. They did not seem either particularly hopeful or pleased with their appointment.

The scheme of assessing each District Association at 8 annas an acre to provide Assistants for the Scientific Officer was only accepted by Mysore, though there seemed to be an idea that other Associations would before long form themselves into groups and join the scheme.

You will probably have seen that a new rule was carried at the meeting with regard to Mr. Anstead's visits, and those who are interested in *helopeltis* will have noticed his remarks on the uselessness of his visiting a District for a few days to study their pests.

Finance we have already discussed, I think, therefore, I have given all the information about the Meeting which would be likely to interest you.

The Meeting accorded a unanimous vote of thanks to Mr. Bissett for representing us at the U. P. A. S. I. Meeting.

The Meeting terminated with a vote of thanks to the Chair.

(Signed) J. S. WILKIE, *Hon. Secretary.*

[*This is erroneous. Mr. J. Carson Parker succeeds Mr. George Romilly on the Committee, and does not take the place of Mr. A. D. Jackson, who, though representing the Madras Chamber of Commerce, kindly undertook to hold a brief for planters as a special case—Ed., *P.C.*]

The Coffee imported into Russia in 1910 came mostly from Hamburg. The finer kinds are little drunk. The cheaper kinds are most asked for they are also replaced by cheap substitutes.

——:o:——

The inauguration during 1910 of a direct Swedish line of steamers with Brazil was the most notable event in the Swedish coffee trade of that year. Coffee is very much drunk in Sweden by all classes, especially the peasantry. The new line has been able to make arrangements with the steamship companies hitherto engaged in this trade with Sweden, and so far no ruinous freight competition has occurred. In 1909 the importation of coffee largely exceeded the normal and immediate demand in anticipation of an increased duty. The importation during 1910 was consequently much less than that of 1909.

CORRESPONDENCE.

Nitrate of Lime.

Dear Sir,—My experience of the above manure bears out Mr. Anstead's objections to a certain extent, in that it is difficult to apply.

I ordered two tons for experimental purposes and found that the mixing with Phosphates and Potash and applying was a very troublesome business; the Nitrate of Lime almost "melting" as it was handled.

It seems, however, to act more quickly than "Nitrolim" and its effect on both tea and coffee is distinctly good, and I have ordered a further supply as the results seem to justify the extra trouble entailed.

When I say "results," I mean the *appearance* of the bushes, as it is too soon for actual yield.

As regards what would happen if Nitrate of Lime was stored for a long time I cannot speak as I do not know how long Messrs. T. Stanes & Co. had had these two tons in stock before sending it up to me, but it arrived in excellent condition and I may incidentally mention that it came up by cart from Mettupalaiyam in heavy rain.

6-11-11. (Signed) A. S. DANDISON.

Dear Sir,—With reference to my letter on the subject of the deliquescence of Nitrate of Lime published in the *Planters' Chronicle*, p. 679, the last issue of the *Agricultural News* received from the West Indies quotes an article in the *Journal of the Royal Horticultural Society* for May, 1911 dealing with this very point as follows :—

"Attention is drawn to the fact that commercial nitrate of lime is a pale brownish compound, free from smell, and at first finely granular. The amount of calcium nitrate present is 75 to 77 per cent; the rest is water and a very small amount of other substances. As is well known, nitrate of lime is very soluble in water; not only this, but it possesses in a marked degree the property of absorbing moisture from the air.

"In connection with the last mentioned property, an experiment was devised for the purpose of comparing it, in this respect, with calcium cyanamide and nitrate of soda. For the purpose, weighed quantities of each substance were placed in small open dishes standing over water, under bell jars, an arrangement which gave the best chance for water to be absorbed. The dishes and their contents were again weighed after forty-eight and 120 hours of exposure to the moisture-laden atmosphere. At the end of the first period, 100 parts by weight of the calcium cyanamide, the nitrate of soda and the nitrate of lime had increased respectively to 102·7, 105·8 and 115·6; while at the end of 120 hours the similar figures were 158·7, 226·9 and 247·2.

"It is thus seen that nitrate of lime absorbs water from the air very readily indeed, the effect being to produce a sticky mass in the place of a granular substance. The possession of this property makes it difficult to apply the manure to the soil unless it is used immediately after the packages are opened. The difficulty appears to have been partly met in some instances by making the manure with ashes before spreading it abroad."

"A matter to be remembered is that if superphosphate is mixed with nitrate of lime, the mixture should be made use of immediately, for if it is kept, its manurial value decreases owing to the chemical actions that take place."

R. D. ANSTEAD,
Planting Expert.

8-11-11.

RUBBER.

On the Occurrence and Nature of Spots on Para Sheet and Crepe.

In "A Preliminary Note," by Mr. Keith Bancroft, B.A., published in the *Agricultural Bulletin of the Straits and Federated Malay States*, it is remarked :—

Since the market value of rubber is considerably influenced by its appearance, it is desirable that there should be no deviation from the normal colour when the product is placed on the market. The occurrence of spots of different colours on sheet and crepe lowers the market value considerably. Pink or red, bluish and black spots were found to occur first on sheet in this country and then on crepe. During this and the previous year spotted sheet and crepe have been reported from several plantations, and the quantity of spotted rubber appears to be on the increase.

Similar red spots have been reported from Borneo by Brooks, where they were said to occur in some quantity, as many as 288 being present in one square foot in some samples. Brooks claims to have obtained an organism in strong crimson culture on bread and agar-agar which appeared to be *Bacillus prodigiosus*; and he concludes that the organism was introduced into the latex by the use of pool water.

Petch also reports the occurrence of red and black spots on "biscuits" in Ceylon, but says that he is unable to associate them with micro-organisms.

Samples of a pink spot occurring in this country were sent to England and were identified first as being due to a yeast and later to *Bacillus prodigiosus*.

It had been found that these spots do not occur on smoked rubber; and since smoked sheet and crepe commanded a higher market price, the spots were regarded as being of little or no economic importance. Recently, however, there has been a decreasing demand for smoked plantation rubber; and this, coupled with the increase in the quantity of spotted rubber in this country, renders the matter of some economic importance.

Investigations were, therefore, commenced for the purpose of ascertaining the cause of the spots. It was inconceivable that they were due to chemical changes in the substance of the rubber and it appeared probable that they might be due directly or indirectly to the growth of a micro-organism. The fact that a pink spot had been attributed to *Bacillus prodigiosus*, which occurs in tap and pool water in this country, rendered it likely by analogy that the blue or bluish brown spot was due to another bacillus and, perhaps, *Bacillus violaceus*.

Attempts were made to isolate chromogenic bacilli by transferring sections of the spots to bouillon and by grinding the spotted rubber with sand in a mortar and making "poured plates" in bouillon-agar. All attempts to isolate chromogenic bacilli, however, failed.

Recently a method of observing directly the organisms present in the spots has become available. It consists in cutting thin sections of spotted rubber and dissolving the caoutchouc by means of xylol or benzene. If the section be placed on a slide the caoutchouc may be thus dissolved and the organism may then be mounted in Canada balsam and examined under a microscope. By this method the following observations have been made :—

The pink spot contains the mycelium of a fungus whose cell walls are coloured pink. The hyphae vary in size from 3 microns to 5 microns and their walls possess an irregular outline. They are much branched and fre-

quently septate and at the ends of the branches are borne singly what appear to be spores. These spores are unicellular and contain refractive globular masses which afterwards become brown.

The pink discolourations on rubber may take the form of small isolated spots or may attain a size of one inch in diameter. In some cases the discolouration is, however, more diffuse.

The blue spots may be present on the same sheets as the pink spots or they may occur on separate sheets. They contain a mycelium composed of hyphae of a dark colour which give rise to globose structures occurring in a single chain; these may or may not be the spores. Attempts are being made to isolate this organism and to identify it.

The black spots sometimes exhibit a definite radial growth from a central point. They contain a mycelium which is composed of dark-brown hyphae; so far no structures have here been observed which can be regarded as spores.

The black and the bluish spots have not been observed to exhibit a diffuse growth through the sheet. They have always been found to be limited to definite small areas.

The spots appear after the rubber has been placed in the drying house. They continue to increase in size at first, but later the growth ceases. The discolouration is retained permanently for several months at least, since the spots on sheets which have been kept for five months have in no way lost any of their colour. The colour of the pink spot is soluble in methylated spirit after prolonged soaking; but this is not the case with the blue spot. Solvents of this nature, however, render the rubber tacky.

So far no chromogenic bacilli have been observed in the spotted rubber in this country. The attribution of the discolourations to the mycelium of fungi sheds a new light on the subject. Since the fungi are in all probability capable of being reproduced by conidia, the principal mode of contamination is through the air and not through the water. The fact that the spots had been previously observed to spread from an infected sheet to its neighbours in the drying house had indicated that the infection might be air-borne; while the occurrence of the pink spot on the exposed parts of sheets and its absence from the parts which were in contact with the hanging bars in the drying house suggested that these sheets had been infected from some external source after they had been prepared.

It will be necessary to study the occurrence and exact methods of reproduction of the organisms before any accurate knowledge of the methods of treatment can be obtained. It is unlikely that any solvents will be applicable owing to the difficulty in obtaining a solvent which does not affect the rubber. At present all sheets which are spotted should be removed from the drying house at once and should be kept apart from those which are not spotted.

As rapid a drying as is conveniently possible should be effected, and the drying house should be well ventilated. Where spotting of the sheets occurs in quantity the walls and woodwork of the building may be sprayed with a solution of potassium permanganate in water; the permanganate should be bought in the form of crystals and added to the water until the liquid is pale rose in colour.

A study of the organisms will lead to a knowledge of their occurrence and the means by which infection is spread, and will, therefore, enable us to draw conclusions as to the most suitable means of keeping them under control.

Pepper on Rubber Estates.

The rise in agricultural produce has at last spread to pepper, a product which is of some importance on many rubber estates, especially in parts of Ceylon, Java and South India. It is a crop which under ordinary circumstances does not strongly appeal to Europeans from an important standpoint; this apathy has its origin in the fluctuating but generally poor prices obtained for the finished article, the poor yield and liability to disease. The accompanying photograph shows how the pepper is, as a vine allowed to grow up the stems of trees other than rubber. The vines are here shown climbing up dadap trees and areca-nut palms; often cotton trees and others with prickly stems are used for the same purpose.

The great objection against its cultivation on rubber estates is that it necessitates the growing of other trees along which it can climb, and as areca-nut palms are generally favoured by natives, the soil is often greatly impoverished by the superficial roots of that greedy feeder. It is true that it is occasionally allowed to trail on the ground and to grow over stumps of felled trees; even then it tends to seriously interfere with weeding on the estate.—*The India-Rubber Journal.*

The Consumption of Young Castilloa Plants.

Interesting experiments have been undertaken recently, in Malaya, for the purpose of ascertaining the manurial requirements of Pará rubber plants. These have been followed at the Jardin Colonial, Nogent-sur-Marne, by similar experiments in relation to *Castilloa elastica.* The results of the latter work are presented in *L'Agriculture Pratique des Pays Chauds* for June 1911, from which the following information is taken.

The work was done with plants of *Castilloa elastica* one year old, and the method employed was to determine their mineral composition in order to obtain some indication as to a rational course of manuring of such plants. It is pointed out that the composition of the young plant is probably not identical with that of the matured tree; nevertheless the analysis of it is likely to give indications of the composition of the ash of the adult plant. Again, it should be useful to know what is to be found in the ash of young plants, in order that they may receive adequate manuring for the purpose of accelerating their growth and giving them the vigour by which they may be able to withstand the attacks of pests and diseases.

The following information concerning the composition of young Castilloa trees is taken from a table given in the article. The selected details are, in percentages:—

	Ash.	Dry Material.	Green Material.
Water	0·00	0·00	82·67
Nitrogen	0·00	2·57	0·445
Ash	100·00	13·65	2·365
Sulphuric Acid ...	6·07	30·8	0·114
Lime	23·21	3·11	0·539
Potash	8·84	1·21	0·210
Soda	8·30	1·13	0·196

A scheme of manuring based on this table is drawn up and attention is directed to the fact that the chief bodies that appear to be required by the plant are nitrogen, lime and potash.

It is intended to conduct manurial experiments, based on information of this nature, at the Jardin Colonial, and the suggestion is made that similar trials should be made on estates.—*Agricultural News.*

SOILS AND FERTILISERS.

Some Observations on the Nitrogen-fixing Bacteria Associated with Leguminous Plants.

Mr. Thos. L. Bancroft, M. B., writes in the *Queensland Agricultural Journal* :—

I consider it wrong now to regard the bacterial nodules as disease.

Every species of the order *Leguminosae* seems to be living in association with a specific bacterium; they (the plant and its bacterium) live in conjunction apparently as messmates for mutual benefit.

The legiminous bacteria can be differentiated, one from the other, by their appearance under the microscope and by their behaviour to straining re-agents.

The particular bacterium connected with the common pea, for instance, will not live in association with lucerne, neither would the several kinds on our wattles live on the Moreton Bay chestnut; each plant has its own bacterium, and no other bacteria benefit that particular plant.

These leguminous bacteria are almost certainly unable to live an independent life in the soil apart from their associated plants. There is an erroneous idea prevalent, however, that they do live independently; that failure in growing any legume in a healthy condition is regarded as due to the absence of nitrogen-fixing bacteria in thes oil. The Americans at one time—I do not know whether the practice exists still—recommended a farmer about to plant to communicate with the Department of Agriculture, stating the kind of crop he proposed growing, and the Department would supply a small packet of earth containing the particular bacterium that would benefit the crop; the contents of the packet was to be mixed with a large quantity of earth, and this distributed over the ground preparatory to sowing. Well, that procedure may possibly benefit some plants, but it is absolutely useless and unnecessary for a leguminous crop.

There are many different saprophytic bacteria of the soil which are capable of fixing nitrogen from the air present in the soil in binding up their own tissues; such bacteria when dead and decayed would serve as nitrogenous manure; the *leguminosae*, however, cannot benefit from nitrogenous manure, and do not require it, as the bacteria living in association with them supply all the nitrogen required. I once made the attempt to grow lucerne free from the bacterial nodules on the roots, and found it impossible, for as soon as the plant is rid or nearly rid of its bacteria, its constitution is so weakened that it sickens and eventually dies. I proceeded in this way: having procured a bag of scrub soil from a locality miles away from any cultivation, and which soil could never possibly have been contaminated with lucerne, I filled some new flower pots with it and planted lucerne seed. It grew well, and the roots were covered with nodules containing bacteria; it made no difference whether the soil was heated to redness previous to sowing or the young plants only watered with water that had been boiled; nodules were formed just the same. I tried trimming off the nodules and small roots, scrubbing well what root was left; if the plant grew at all after this treatment nodules formed again.

The seeds contain the particular bacterium associated with the plant. You might plant a dozen different leguminous seeds in the same pot and each will produce nodules on the roots containing its own special bacterium. Failure to grow a leguminous crop is certainly not due to the absence of nitrogen-fixing bacteria, but to other causes, such as unsuitable climate, deficiency of lime, potash, phosphorus, &c.

The leguminous bacteria permeate the whole plant; cuttings of lucerne struck in sand and transferred to sterilised soil produce nodules on other roots. By taking off the new growth of a rooted cutting of lucerne and striking it in sand, and repeating this procedure from the second cutting, you can get a piece of lucerne free from bacteria, but it will not grow; that was my experience, but I hope shortly to make further experiment in this direction.

Nitrogen from the Air—Nitrolim.

In April, 1910, *the Queenstand Agricultural General* published a short article on "Cyanamide as a Fertiliser," in which it was pointed out that calcium cyanamide is a cheap, concentrated, nitrogenous manure—a recognised substitute for nitrate of soda and sulphate of ammonia. The same contemporary now states that this substitute, under the name of "Nitrolim," will, under normal conditions, it is claimed by the manufacturers, produce on all classes of soil (with the possible exception of sour, swamp land) a considerable increase in crops, comparing more favourably with results from the use of other and far more expensive nitrogenous manures. The active fertilising constituent of Nitrolim being nitrogen—guaranteed analysis 18 per cent. nitrogen, equal to 22 per cent. ammonia—as is the case with nitrate of soda and sulphate of ammonia, a good supply of phosphate of lime and potash applied by suitable artificial fertilisers, such as kainit and superphosphate, is necessary with each crop.

In order to ensure the best results from Nitrolim, a few simple but important rules must be observed in its application. To begin with, it should be mixed with at least twice its weight of fine soil and applied 10 to 14 days before sowing or planting, and the mixture should be spread over the land as uniformly as possible. It should then be ploughed, harrowed, or dug in to a depth of 3 or 4 in., and wherever practicable, immediately after spreading. It should not be spread in rainy or windy weather, and it is well to allow the mixture to stand 10 or 14 days, in order that it may give the best results as a top dressing. Generally speaking, it should not be used by itself as a top dressing, but only when mixed with phosphates and covered. After burying as explained, the fertiliser will gradually sink into the soil.

An excellent mixture for autumn and winter application* is 3 to 4 cwt. of kainit mixed with 1 to 2 cwt. of Nitrolim, thus supplying the necessary nitrogen and potash. In the spring 3 to 4 cwt. of superphosphate should be applied in soluble form, and thus a complete manuring will have been given. By mixing the Nitrolim with kainit, the moisture in the latter is absorbed, and any objection to the handling of Nitrolim by by itself, owing to its dusty nature, is avoided. Similarly, by mixing Nitrolim and superphosphate, and sprinkling the heap with a little water while mixing, a very satisfactory compound is produced, pleasant to handle, and easy to spread by hand or by machine. Although by the chemical action set up, the water-soluble phosphates in the superphosphate are partly reverted, the phosphates, nevertheless, remain in an extremely soluble condition, and results are excellent. There is one point about Nitrolim which adds greatly to its value, and that is, that it contains a large percentage of lime, and, if applied regularly, it will to a great extent, do away with the necessity for liming, and will keep the soil sweet.

When mixing the two fertilisers (Nitrolim and Superphosphate) they should be kept sprinkled with water to keep down the heating produced by the slaking of the quicklime in the Nitrolim.

[*It should be borne in mind that the writer deals with cereals, not with coffee.—Ed., P.C.]

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Book of Proceedings, 1911.

Planters who have not already sent in their orders for the Book of Proceedings 1911, are requested to register them as soon as possible. There has been great delay in the publication of the book this year, but the volume ought to be ready before the end of the current month.

Coffee.

On another page will be found extracts from an interesting address delivered before the New York Coffee Exchange by the Commissioner of the State of Sao Paulo. The remarks there quoted give only Mr. de Lima's remarks on Coffee cultivation and preparation. He spoke also of certain matters connected with the retailing of the product, and some of his words deserve to be brought to the notice of planters in Southern India. Speaking of "the way coffee is handled in this country, constantly exposed to the weather, whether in winter or summer, spring or autumn, wrapped in loose paper bags instead of well sealed tin cans, after it has been roasted and ground" he observed:—"In the first place, your coffee is half-roasted and not ground finely, these two processes preventing coffee sippers from partaking of the true essence and flavour of the bean. Your coffee, allow me, especially up the State, has a raw taste only drinkable, only tolerable, when cream comes to its rescue. Half roasted coffee does not precipitate enough caffeine, the principal cause of so many nervous diseases, affecting most people leading an intense and strenuous life. Let us not blame the coffee but the way it is made. Foreigners in Brazil drink coffee as much as we do, never making any complaint as I have heard in this country so often. Most any doctor here for his own recreation, without studying the causes, prescribes against the beverage. Coffee, except at breakfast should be drunk in small quantities, that is in small cups. It helps digestion, it brightens the intellect, fitting the man for hard work, when drunk straight, as commonly said. Coffee should be made every time we wish to take it. Always use fresh water by heating it until it comes to the boiling point. After that pour it into a bag containing fine pulverized coffee. Never forget to stir the mixture with a table-spoon. In that way all the essence of the bean will adhere to the liquid below. I dare say that at no distant day, a radical change will take place in the way coffee is exported and manipulated. Why should not coffee be treated on the same level as tea?"

A propaganda of this kind should be preached, in the interest of the planter, throughout the civilised world.

Scientific Officer's Papers.

LXXXIII.—Genetics.

Genetics, which is the study of Plant and Animal breeding with all the problems of physiology, of heredity, fluctuating variation, selection and mutation, and the transmission of acquired characters, has become of such interest and importance since the discovery, or rather rediscovery, of the laws enunciated by Mendel that it has become quite a specialised science with its own literature and Societies.

Mr. W. Bateson, F. R. S., one of the leading authorities on the subject, in the course of his address to the Agricultural Sub-section of the British Association, of which he was Chairman this year, said:—

"To name the disease, to burn the affected plants, and to ply the crop with all the sprays and washes in succession ought not to be regarded as the utmost that science can attempt. There is at the present time hardly any comprehensive study of the morbid physiology of plants comparable with that which has been so greatly developed in application to animals. The nature of the resistance to disease characteristic of so many varieties and the modes by which it may be ensured, offers a most attractive field for research, but it is one in which the advance must be made by the development of pure science, and those who engage in it must be prepared for a long period of labour without ostensible practical results. It has seemed to me that the most likely method of attack is here, as often, an indirect one. We should probably do best if we left the direct and special needs of agriculture for a time out of account, and enlisted the services of pathologists trained in the study of disease as it affects man and animals, a science already developed and far advanced towards success. Such a man, if he were to devote himself to the investigation of the same problems in the case of plants, could, I am convinced, make discoveries which would not merely advance the theory of disease-resistance in general very greatly, but would much promote the invention of rational and successful treatment.

The study of Genetics has already done much for Wheat in England and for Cotton in India, and it is hoped that in the near future it may do something for Coffee. There is no reason why it should not do much for Tea and Rubber were a suitable man employed to study these crops from the genetic point of view.

There has been held recently an International Conference of Genetics, the fourth of its kind, at Paris, at which many interesting papers were read, some of which are not too technical to be understood by the layman.

Among the many subjects discussed by the learned gentlemen at the Conference one of the most interesting from the planters' point of view was the possibility of raising disease-resistant plants. *Disease-resistant* be it noted, not immune from disease; there is no such thing probably as a plant which is immune from all diseases. This subject was dealt with by Mr. W. A. Orton, the Pathologist to the Washington Department of Agriculture, who described the resistance of plants to one special kind of disease, the 'wilt disease' caused by a particular genus of Fungi known as *Fusarium*. Members of this genus cause well marked wilt diseases of Cotton, Cow Pea, Water Melon, and Flax amongst economic plants, while in gardens among ornamental plants the wilting off of Aster plants will be a familiar nuisance to many amateur gardeners in this country. In India *Fusarium udum* has been reported as the cause of a wilt disease of Pigeon Pea in Volume 2, No. 9, of the *Memoirs of the Department of Agriculture in India*.

Mr. Orton indicated how plants could be bred to be resistant to this disease, and the following extract from a digest of his paper is quoted from the *Gardeners' Chronicle* :—

" Fusarium is a genus of parasitic fungi the species of which are highly specialised, and live in the vascular tissues of their respective hosts. Infection takes place from the soil through the young roots, and occurs independently of conditions, favourable or otherwise, in which the host-plant is growing.

" Among Cotton plants, the degree of resistance to wilt is generally but slight, though occasionally a Cotton plant is met with which is immune. By self-fertilisation of such a resistant plant, strains of plants have been raised which have maintained their powers of wilt-resistance for several years."

" Mr. Orton's experimental breeding work with the Cow Pea is peculiarly interesting and important, inasmuch as he has shown that, in the first place, a variety may exhibit resistance to the attack of more than one kind of parasite. Thus, a variety, Ivon, has proved to be immune from the attack of the wilt fungus (*Fusarium tracheiphilum*), and also from root knot, the disease caused by the eel worm (*Heterodera radicicola*). When the resistant variety, Ivon, is crossed with high-yielding but susceptible varieties, the resulting hybrids (F_1) are resistant, and in F_2 plants are obtained which combine this quality with that of the high yield characteristic of the other parent.

" The problem of discovering wilt-resistant varieties of Water Melon (*Citrullus vulgaris*) was rendered difficult by the fact that none of the edible varieties is immune. It was therefore necessary to start with a non-edible resistant variety, and to cross it with the better varieties in cultivation. In F_1 the hybrid showed qualities intermediate between those of the parents, F_2 exhibited great variability ; but in the third generation (F_3) a race was obtained which was resistant to wilt and of edible quality. Subsequent selection during five years has resulted in the isolation of a variety, Conqueror, which leaves nothing to desire with respect to resistance and general quality. It is noteworthy that the variety Conqueror is not resistant in all regions. Thus it is immune from wilt when grown in S. Carolina and Iowa, but loses its resistance in Oregon. Though this fact cannot fail to be disturbing to the practical mind which would wish to secure a disease-resister once for all, it is by no means surprising, and shows that, in attacking the problem of raising disease-resisting forms, locality must be taken into consideration."

RUDOLPH D. ANSTEAD,
Planting Expert.

Re-imported Teas in Western Australia.

The Perth correspondent of the *Times of Ceylon* writes :—" The State Government Statistician has presented his report of the imports from the Eastern States into Western Australia for the month of June. The following figures are of interest to Ceylon as they relate to tea :—From New South Wales 2,980 lbs. of tea valued at £142, was brought in. The countries of origin of the teas and bulk are :—India, 983 lbs.; Ceylon, 1997. From Victoria, 83,192 lbs., valued at £4,414 ; countries of origin : India, 41,197 lbs. ; Ceylon, 35.006 lbs.; China, 1,578 lbs.; Java 5,411 lbs. ; from South Australia, 59,036 lbs. valued at £1,940 ; countries of origin : India 10,991 lbs. Ceylon 28,045 lbs. The totals show a total importation from Eastern States of 125,208 lbs., valued at £6,496."

Notes and Comments by the Scientific Officer.

138. *Stump Rot in Tea*:—In the issue of the *Rubber World* of 19th October in the course of an article on 'Tea and the Planter' the following paragraph appeared :—

"I notice that a planter correspondent takes exception to two items of the interview with Mr. Clark. I should very much like to know whether there are many people who would agree with Mr. Clark that rotting stumps do no harm to Tea. Certainly, there are well authenticated instances in Assam of a fungus type of disease arising from the old stumps. Posssibly in Travancore the soil is not favourable to such a fungus. Can Mr. Anstead, if this paragraph should meet his eye, enlighten us on the point?"

The statement by Mr. Clark which was taken exception to was his answer to the question, "you do not clear away the burnt logs, or remove the stumps?" to which Mr. Clark replied, "No; they do no harm to Tea, and, not doing harm, they probably enrich the soil as they rot."

I cannot agree with Mr. Clark that stumps do no harm to the Tea, nor will present day Travancore Tea planters agree with him. Possibly in Mr. Clark's day Stump Rot had not appeared, or, what is more probable, the cause of this disease was not recognised. However that may be, at the present time Travancore, in common with other Tea districts, does suffer from Stump Rot. Every stump left does not foster the disease of course, but certain trees almost always start it, the Tea gradually dying round them. The most notable of these as far as Travancore is concerned, are the 'Silver Oak' (*Grevillea robusta*), the *Albizzias*, and 'Benteak' (*Lagerstroemia lanceolata*).

The question of removing stumps after the jungle is cleared is one of expense, but I think I am right in saying that Tea planters in general are coming to the conclusion that in spite of the initial expense it is the cheapest method in the long run, and the demand for Stump Jacks through the office is an annually increasing one. Petch when dealing with the subject in his book on "The Physiology and diseases of Hevea brasiliensis" says :—

"If there were no dead stumps there would be no root diseases either in *Hevea* or tea. But it is not an easy matter to get rid of them, and whatever method is adopted the cost is high. They have, however, been got rid of in certain cases, both in Ceylon and Malaya. In 1906 I recommended that course in dealing with *Fomes semitostus*, and on one affected estate in Ceylon all the stumps were dug out. Several estates have since adopted the same treatment in Malaya, while others are only deterred by lack of funds.

"On a later page the following remark appears :—

"At the annual meeting of the Pataling Rubber Company, in April 1910, it was stated that the expense of uprooting stumps and removing all dead wood came to a total charge, 'once and for all' of less than six pence for each rubber tree; that is not a very heavy insurance to pay to rid the trees of what may cause a great deal of injury."

It is very easy for the Scientific Officer to say that all stumps should be removed, and undoubtedly under ideal conditions they should, but it is a very difficult matter when it comes to estate practice to do this, and the planter can only work as near the ideal as possible under his particular conditions. This is an aspect of Scientific advice which, if I may presume to say so, is rather apt to be lost sight of in Scientific Publications.

The existing conditions in the district must be thoroughly known and the best general advice adapted to those conditions, and this can only be done

by the man on the spot, and no one is a better judge of what can and cannot be done than the planter who has lived and worked in the district for many years.

In this particular instance, as I have said, it is more and more being felt by the practical planter that it does pay to remove stumps from Tea and other crops; it is for the local Scientific advisers to help him to the best and the cheapest means of doing it in each particular locality.

139. *Fomes lucidus.*—A Rubber planter recently sent me a very fine specimen of a Bracket Fungus fructification much resembling that of *Fomes semitostus* which causes one of the Root Diseases of Hevea Rubber. The colour of this fructification did not quite agree, however, with the published descriptions of the last named fungus nor with the excellent plate representing it which forms the frontispiece of Petch's recent book. I sent it on to Mr. McRae, the Government Mycologist, stationed at Coimbatore, and he has very kindly examined it for me and pronounced it to be *Fomes lucidus.* An interesting account of this fungus will be found in an article on Bracket Fungi reproduced from the *Agricultural News* in the *Planters' Chronicle*, Vol. VI, p. 623. There it is said to be known to cause root disease in Ceylon of Cocoanut Palm, Mango, and *Poinciana regia*, the latter being the tree so well known in India as 'Gold Mohur'. Mr. Mc Rae writes of it:—"*Fomes lucidus* has not been definitely proved to be parasitic, but there is good cause to presume that it is. I saw it on a Palmyra whose leaves were all much smaller than the normal and the Palm was in rather a bad way. Coleman has found it on Areca Nut Palms and I believe Butler on *Pinus longifolia* in the Simla hills. It is common as a saprophyte on dead wood in the jungle. If on inoculation it really proves to be parasitic then it can be but a weak parasite. The chances of its becoming a menace to Tea or Rubber are, I think, small." This means that no special precautions need be taken, but that it would be wise to dig out and burn any stumps among the Rubber found to be attacked by this fungus.

140. *Limestone Deposits*:—The discussion which took place at the Annual Meeting, and discussions which have taken place at Planters Association Meetings during the year, have convinced me that some united effort should be made to reduce the cost of Lime delivered on the Estates. It is generally admitted that Lime is necessary for our Soils in Southern India, and it is unanimously agreed that at present it is too expensive to apply in such quantities as are usually recommended, *viz.*, two tons an acre or more. It is possible that other sources of Lime besides those at the Coast might be found, and I am accordingly undertaking an examination of all sources in the neighbourhood of planting districts which might be profitably worked from them when the cost of transport is taken into consideration. I have already received, through the kindness of the Honorary Secretaries of several District Planters' Associations and Coast Firms, samples of stone from known sources, and I should be much obliged if any planters knowing of Limestone Deposists which are within reasonable reach of planting districts would be good enough to send me a representative samples of about two pounds of the crude rock from them, together with full descriptive notes upon the locality, the probable amount of the rock, and the possibility of its exploitation should it prove to be suited to agricultural purposes. I am anxious to complete my investigation as soon as possible and for it to cover as much ground as possible so that the matter can be further discussed with a view to co-operative action amongst the planters or their agents.

R. D. ANSTEAD,
Planting Expert.

CORRESPONDENCE.

Nitrate of Potash or Refined Saltpetre.

Dear Sir,—With reference to recent correspondence regarding Nitrate of Lime and Nitrolim, and also the comparative value of these fertilizers as regards their Nitrogen contents, we would like to draw your attention to the value of the above fertilizer, Nitrate of Potash. Unfortunately supplies of this fertilizer are limited, but if Planters would be willing to pay a somewhat higher price, it would be possible to secure larger supplies.

We beg to refer to the tabular statement on page 633 of your issue of October 14th last, in which it was shown that of the six fertilizers mentioned therein, Nitrolim was the cheapest per Unit of Nitrogen. If Refined Saltpetre is compared with the fertilizers referred to in that tabular statement, we think it will be seen the cost per Unit of Nitrogen will come out very considerably in favour of Refined Saltpetre. The Saltpetre supplied in South India is guaranteed 70% purity, and if care is exercised in only securing the really good quality of Refined Saltpetre it would analyse at least 9% Nitrogen, and 35% Potash.

Sulphate of Potash contains 50% Potash, and costs Rs.200 per ton, and so the unit value of Potash may be taken as Rs.4 for our purpose, although it is generally admitted that the Potash in Saltpetre is of higher value.

Our present price for 70% Refined Saltpetre is Rs.205 per ton, but even allowing a wide margin for possible rise in price, and taking the price at Rs.220 per ton, the unit value of Nitrogen works out not even Rs.9, as follows:—

Saltpetre contains 35% Potash which at Rs.4 per unit is worth Rs.140 leaving a balance of only Rs.80 for the Nitrogen, and as it contains fully 9% Nitrogen the unit value is only Rs.9 against Rs.11 for Nitrolim.

We think that when Planters appreciate the value of Nitrate of Potash, they will be prepared to pay a higher price for it, in which case we hope larger quantities will be available.

for T. STANES & CO., LTD.,
(Signed) F. J. STANES,
Director.

THE FAILURE OF COCOA VALORISATION.

The *Frankfurter Zeitung* states that the plan proposed recently for the valorisation of cocoa on the same lines as the coffee valorisation scheme has fallen to the ground. Apparently the participants in the scheme were to be Ecuador, Bahia, San Domingo and Portugal, and it is said that a London firm connected with the coffee experiment was ready to finance the proposal to the extent of ten million dollars. From the beginning the scheme was doomed to failure. Cocoa, unlike Santos coffee, actually deteriorates in quality when stored. An attempt of a Lisbon syndicate some five years ago was easily defeated by the English manufacturers, and the forced sale of the cocoa held back brought a heavy fall in price. Cocoa, also, is delivered almost direct into the hands of the manufacturers from the planter, and no delicate future dealings, as in coffee, exist. But what finally makes any rise in price improbable is that the cultivation of the cocoa bean can be very easily increased, and that already world-production is considerably higher than world-consumption, the world harvest in 1910 being 220,905,024 kilograms and consumption only 200,779,300 kilograms.

COFFEE.

The Coffee Industry of Sao Paulo.

Extracts from an Address by Mr. J. C. Alves de Lima, Commissioner of the State of Sao Paulo, Brazil, before the New York Coffee Exchange.

Coming from Brazil and a resident of the State of S. Paulo, which supplies more than one-half of the world coffee consumption, I may be permitted to engage your attention for a little while in the discussion of this important staple constantly playing in your mind, every day, every hour, every minute, in this great centre of business and strenuous life.

Many people in this country have the idea that coffee can be grown almost in any section of our planet so long as the zone is tropical that is, a very hot one. Experience proves that coffee can be grown to a certain extent, in countries like Java, Sumatra, Philippine Islands, Cuba, Porto Rico, Hayti, Central America and in the northern part of Brazil, but experience also teaches us that coffee trees will not stand many years yielding profitably in those regions because of certain climatical conditions and a special quality of soil I shall have to explain to you in the course of our conversation just at present.

Another erroneous idea also prevails among the business men of this country, *viz.*, that the bean can grow profitably commercially speaking, even all through the State of S. Paulo, the acknowledged coffee zone of the world. That is another mistake which, in time, must be corrected. In fact, coffee is so particular, so capricious, depending so much, as I said before, on special conditions such as climate and soil that Providence has seen fit to reserve to us only a narrow strip of land, not more than 150 miles wide by 7,000 miles long, where coffee can grow in such a marvellous and healthy condition, as to monopolize the world coffee market. Beyond that, we have found out by experience and by travelling through other countries that, outside the S. Paulo region the raising of coffee, in a profitable way, will hardly pay its exploitation. Should we stretch our arms to the north of our strip of land in S. Paulo we find that the degree of temperature is too hot for the proper preservation and durability of the tree, it requiring the growing of other trees with plenty of foliage to protect the coffee trees from the solar rays of the tropical zone. It therefore stands to reason that such a scheme would prevent the coffee trees from growing strong and healthy, some beans reaching the state of maturity while others would be still green during the time of gathering. Should we look the other way, towards the south of our same strip of land, other disadvantages would occur, bringing out the same drawbacks as before, such as the cold winds blowing from the South Pole, which would tend to decrease the heat and necessary light for the bean to grow well and mature equally. In such a zone I have many times noticed beautiful and large trees with plenty of foliage but with not enough coffee to compensate the work of the planter. I have visited some coffee plantations in the tropical zone surrounded by any amount of banana trees and other shady bushes, and I was wondering whether I was visiting a coffee plantation or a coffee nursery, coming to the conclusion that, had I been the owner of those plantations, I would rather have gone straight into the banana business as the most profitable of the two, under those conditions.

Now, gentlemen, from this brief description, you can draw your own conclusions, you can form a clear and rational idea of the superior advantages that we have over any coffee region in the world, I do not care whether that region lies in Central or South America or in Asia or in Africa. The fact is that with a comparatively small area we are prepared for many years

to come to supply you and the rest of the world with all the staple that you may need, cheaper than any region can, because of our special zone and climatical conditions.

The most suitable land for coffee ought to have for its first strata a red purpled earth of volcanic origin with no particle of clay in it, carrying enough proportion of iron and sand to become porous allowing the tap root of the tree to go about six feet right into the ground. The tree is bound to die at any time should these conditions be not properly fulfilled. The soil ought to be neither too steep nor too flat, but of a gentle slope with enough inclination to allow humidity to permeate through the tap-root and the horizontal roots without soaking the soil. A steep soil would have also a tendency of carrying away the *humus* so indispensable to the tree doing its duty every year. Coffee is planted in rows by using for seed the bean in hull and at a distance, about 14 feet apart, so the heat and the light will penetrate through every limb of the tree equally. That explains why, under the equator, we always prefer the north side to the south side for the cultivation and preservation of our large coffee plantations. As in your great country there are farmers and farmers. so in Brazil there also are planters and planters.

In our country the intelligent planter cannot afford to weed his thousands of trees less than six times a year to arrive at a profitable result ot the end of the year. After the abolition of slavery all the work has been done, so far, by "piece of work," that is, the coffee planter entering into an agreement with one or more families of hired people, native or foreign, for the performance of a certain kind of work during the day or at night. The planter pays his hired people so much for the weeding and pruning of so many thousand trees of coffee, or so much for gathering of every alqueire of coffee in hull, about a bushel, stripped from the tree, so what the hired man receives from the planter is in direct proportion to the amount of work performed by him. A fair plantation yieds, on an average, about 32,000 pounds per 10,000 trees. To start (*formar* is the proper word in Portuguese) a coffee plantation we usually select a tract of land, a virgin forest, by felling its trees and cutting down all its bushes right to the ground. The soil must be about 2,000 feet above the level of the sea, that preserving the trees from the frost. Some planters burn the big trees and bushes after being felled, while other, more farseeing, more intelligent, ship the best wood to the market and allow others, of poor quality, to be decomposed through exposure to the atmosphere, this new earth constituting, in time, the best fertiliser that, under the circumstances, we can supply to the coffee trees. The hull of the bean is also a splendid fertilizer, and it is a wonder to me that you do not make a better and more practical use of this rich earth in your public gardens and parks and instead of that dumping it into the sea as I am told. . . .

When the month of June comes the planter must have his thousands of trees properly swept around their trunks to receive the bean in hull which has to be stripped right to the ground. Our crop is so large compared with that of our competitors, that we would have scarcely time to move the whole crop by gathering coffee almost the year around, bean by bean. as it is the custom in those countries where the maturing is so unequal. As a matter of cleanliness and saving of labour, a sheet of cotton cloth is spread right around the trees for the quick gathering of the bean, When the whole crop has been sent down to drying grounds and to the huller and then shipped mostly to our coffee seaport—Santos—it is time for the planter to prepare his trees for the coming crop. Then the pruning of the trees begins by cutting down limbs which cannot yield any more

beans. All this work must be done long before September—the beginning of the flowering of the crop. By that time the trees have had enough rest to bear well again. The weeding of the trees has to continue all the time one after the other, and more so during the rainy season when vegetation is far stronger than in any other season. Some planters, as a matter of economy, use the space between the trees by sowing corn, beans and other cereals; but experience has taught them that this apparent economy of soil will react against the building up of the coffee trees, preventing them from yielding a better crop. Coffee being a common tree, as large as an orange tree and not a bush, lasting when on a good soil and when well cared for, from 50 to 60 years, should be left alone to grow healthy and strong so as to give a full compensation to the work of the planter. Moreover, after a certain period, say twelve years, these trees should always be properly fertilized, using, as I said before, the hull of the coffee itself, just as rich and as cheap as the best kind in the market.

As a rule we plant coffee, not in valleys where the soil is generally rich in humus, but right upon the mountains with a gentle slope to protect them from the frost which visits us every year with more or less intensity. While frost, as a rule, puts the planter back one year, still the lowering of the temperature has the advantage of doing away with all sorts of plagues, microbes, which are bound to affect the coffee trees after some years of more or less even temperature. One year of frost equal to the ones we had just this year will mean a big crop two years from now. The frost is, as you see, a blessing in disguise, even if we have to put up with one or more years of small crop. To give you an idea of what I am asserting I could cite some old districts in the State of S. Paulo where coffee used to grow in abundance. With the cutting down of the forests in that particular section of the State a change began to take place in the atmosphere and the consequent disappearance of the frost. Our coffee trees, in view of that, began to appear weaker and weaker all the time until it ceased to be a paying business in that district. We see the same phenomenon and identical cases in our old coffee region in the State of Rio de Janeiro, where the staple is on the decrease as in Java, Cuba and Central America, where the coffee crops are either stationary or on the decline, due to the meteorological conditions above explained and to a certain quality of soil wanting in those regions. Coffee, is therefore, a nomadic plant, moving towards new regions of dense forests, rich soil where frost can have its full sway for its conservation and proper yielding.

In the last twenty years the coffee region has moved westward of our State and partly to the northern part of the coming State of Panama.

After the coffee has been gathered the same is sent to the drying grounds in wagons, drawn by animal power, horse power or electricity. Some coffees are dumped into little canals, flowing at its proper destination by gravity. Some planters have their coffees prepared for market in 36 hours more or less. I mean the washed coffees, but the majority of them use the old process of drying the coffee in large brick-yards and then hulling and assorting it into different grades to be sold. Railroad freight is still very high in our regions. The planter has, however, all the facilities to move his crop at any time to its destination. Our coffee region is pretty well provided with a system of railroads. Coupled with the enormous amount of water-falls under our reach S. Paulo will soon be able to run all our systems of transportation without using a single ton of coal from our principal seaport—Santos—to the interior to a distance of about 1,000 miles.

RUBBER.

Smoked Rubber.

In the *Agricultural Bulletin of the Straits and Federated Malay States* publicity is given to correspondence and analyses referring to a series of experiments conducted at the Botanic Gardens, Singapore, for the purpose of determining how smoked rubber would travel best.

This correspondence, from which extracts are given below, must be read in the light of purely experimental work.

It will be noted that in all instances the criticisms suggest and refer to methods of treatment, as the inherent quality of the rubber as revealed by the analyses supplied is generally satisfactory, and in some instances very little improvement could be expected; indeed, it is doubtful if some of the samples have ever been surpassed.

The latex was coagulated by the smoke process in long ribbons and some samples were despatched a few days after coagulation to London, after being wound in balls and the rubber considerably stretched. Other samples were kept longer and were naturally much drier but also wound in balls and stretched in winding, and, as will be seen, such stretching had a deteriorating effect on the rubber.

The biscuit and sheet referred to in the following correspondence was merely a small lot of ordinary rubber for sale.

Extracts from letter, dated January 12, 1911, from Messrs. Gow, Wilson and Stanton, Ltd., London :—

"We have carefully selected average samples of each kind and requested Professor Wyndham Dunstan to have analyses carried out, and the results of these will be forwarded to you in due course.

"We have now examined the various samples and have pleasure in reporting as follows :—

"*Rubber Described by you as Smoked Brazilian Method.*—Very dark thin irregular shaped sheets. These appear to be composed of thin films of rubber pressed together. They have arrived in excellent condition, in that they are quite free from mould, etc. They have the appearance of very thorough smoking, and the surfaces on arrival had a peculiar greasiness similar to, but more pronounced than that characteristic of Hard Fine Pará. The curing seems thorough and satisfactory in most respects, but the rubber is somewhat soft in character and not as strong as would be expected. Value about that of F.A.Q. Smoked Sheet, *viz.* 5/8 per lb.

"*Sample Described by you as Biscuits, Light Smoked and Second Quality* :—The former are amber coloured small sheet and biscuits, very similar to a previous consignment received from you. Although the rubber has been carefully prepared, is in excellent condition and of good strength, the smoking is rather too slight for the market. Very thorough smoking is at present looked for and most appreciated. The smoke smell on many of the above samples has almost disappeared at the time of writing. Value 1*d.* to 2*d.* per lb. below F.A.Q. Smoked Sheet. The second quality is rough rejected sheets, partly cured, partly mouldy and in unsatisfactory condition.

"*Samples Referred to in your letter of 17th November* just to hand, *viz.*, about 67 lbs. The landing weight of this parcel is about 60 lbs., showing apparently about 7 lbs. loss in transit owing to moisture.

"*Case No. 2.*—Light yellowish roll, consisting of sheet tightly wound up. On being unwound, the rubber is very wet and of a very light grey

colour. It has a nice smell of smoking, but this is hardly pronounced enough. The rubber seems to be very strong, but the winding appears to have had a stretching effect on the sheet, and it somewhat resembles thin Balata sheet in appearance and character. This stretching seems to have an effect on the physical properties of the rubber, and it lacks some of the nervousness and resilience found in ordinary sheet, the effect of the winding would appear to be different from that obtained in the Hard Fine Pará method, this may be due to temperature.

"*Case No.* 2.—This is a narrower sheet than the above, the outsides of the roll darker in colour, otherwise very similar in appearance, there being hardly any difference between the colours of the surfaces of the sheets when unwound. The rubber in this roll, however, does seem a little drier and the sheet is more even in texture and thinner. Both this roll and the above are very hard. The strength of the rubber in this case also is excellent and seems to compare with the Hard Fine Pará; on the whole we are inclined to give this the preference as the curing seems more thorough, in the first case we would describe the rubber as distinctly under-cured. Value about that of Soft Fine Pará, *viz.* 4/6.

"*Sample Referred to in your Letter of 17th November* described as about 3 lbs. sent by mail *viâ* Brindisi. Wound sheet,—this is somewhat similar to the above, rather rougher and not so carefully rolled out or so attractive in appearance. There seems to be more interstitial moisture; the rubber also has free water on the surfaces when the sheet is unwound. Smoking does not seem to be nearly thorough enough. Value about 1*d.* to 2*d.* per lb. less than the above.

"*Samples Referred to in your Letter of 1st December*.—Dark amber sheet in rolls. The rolls have arrived in excellent condition, there is, however, a very marked difference between these and the others rolls, in that these are quite free from moisture, not nearly so tightly wound, and the sheet does not adhere in the same way as in each of the other rolls. The rubber more closely resembles the medium smoked sheet on the market. It is clean and very strong. In the present market this would probably be more valuable than any of the others, as it could be passed as F. A. Q. Smoked sheet. At present buyers look for even darker colour than this, that is to say, more thoroughly smoked. Value about 5/8 per lb.

"Comparing all the various samples in the most important respect, *viz.* strength, the two cases (your letter 17/10/10) and the three pounds post sample (your letter 1/12/10) seem to be about equal. None of the other samples are as good.

Professor Wyndham R. Dunstan remarks:—

"I may mention that the question of the excessive percentage of 'resin' present in some of the specimens of smoked Pará rubber from Singapore has been carefully investigated here. The high figures obtained in certain cases have been found to be due to the presence in the rubber of a sugar-like constituent, derived from the latex, which is removed by hot acetone and is, therefore, included with the resin as usually determined.

Regarding some later samples, Messrs. Gow, Wilson and Stanton reported:—

"The samples are as follows:—Dark brown, thin ribbon in the form of rolls. The rubber has arrived in excellent condition, there being only the slightest trace, here and there, of any mouldiness between the layers.

"The rubber seems to have been thoroughly dried and the curing is very even and appears thorough and satisfactory. The rolls in the portion

marked 5-lbs. 7½ ozs. are rather duller looking and greyer than those marked 6-lbs. 12-ozs. which are a richer brown in colour.

"When unrolled the rubber has the same sort of stretched character referred to in the previous lots and it is very difficult to estimate at all accurately the strength of the rubber in this condition.

"We are of opinion that the strength in each of the samples is very good and fully up to any of the samples previously reported on.

"Though the sides of the ribbons show slight traces of the greasiness referred to for this is not nearly so pronounced as in the wet samples.

The following reports were made by Professor Wyndham R. Dunstan:

The three specimens of smoked rubber from the Botanic Gardens at Singapore, which were forwarded with your letter of the 21st December, have now been examined with the following results:—

No. 1. This sheet of dark brown rubber, slightly sticky on the surface, and having a strong odour of creosote. The rubber was fairly strong but appeared to be rather deficient in elasticity, as strips when stretched elongated very considerably and showed little power of recovery.

The rubber had the following composition:—

	Rubber as received.	Composition of dry rubber.
	Per Cent.	Per Cent.
Moisture	... 2·0	...
Caoutchouc	... 80·7	82·3
Resin	... 5·5	5·6
Protied	... 4·1	4·2
Insoluble matter	... 7·7	7.9
	100·0	100·0
Ash	1·0	1·0

The results of the analyses show that this specimen is abnormal in containing a large proportion (7·7 per cent.) of matter insoluble in chloroform, and a very high percentage of ash. The insoluble portion consisted of dark brown flocculent matter which differed in appearance from the so-called "insoluble caoutchouc" frequently present in Pará Rubber. The amount of resin is very high for Pará rubber and in this respect the sample resembles those previously examined. The percentage of proteid is also high.

No. 2. The sample consisted of pieces of light brown smoked sheet and biscuit which were free from all traces of stickiness. The rubber appeared to be a little stronger than No. 1, but like the latter was easily extended permanently on being stretched.

The rubber had the following composition,

	Per cent.
Moisture	0·5
Caoutchouc	94·1*
Resin	3·2
Proteid	2·1
Ash	0·1

* "Including 1·1% of insoluble caoutchouc."

The percentage of resin, proteid and ash are all much lower in this specimen than in No. 1, and the amount insoluble in chloroform is only 1·1 per cent. compared with 7·7 per cent. in the preceding sample.

No. 3. Two pieces of smoked biscuit rubber, one light brown and the other dark brown; the specimens showed no trace of stickiness. The physical properties of the rubber resembled those of No. 2.

The results of the chemical examination were as follows :—

	Per cent.
Moisture	0·4.
Caoutchouc	95·1.*
Resin	2·2.
Proteid	2·1.
Ash	0·2.

* "Including 1·3 per cent. of "insoluble Caoutchouc."

This sample is the best of the three specimens so far as chemical composition is concerned.

I shall be glad to learn the age of the trees from which these rubbers came and to have some information as to how they were prepared. It may then be possible to discuss further their peculiarities.

No. 4. Two small pieces of thin sheet rubber of light brown colour. The rubber was strong, but easily elongated when stretched and exhibited little power of recovery.

The analysis gave the following results :—

Moisture	3·5
Caoutchouc	89·9
Resin	2·6
Saccharoid substance	1·1
Proteids	2·5
Ash	0·4
	Per cent.

*Including 4·8 per cent. insoluble caoutchouc.

No. 5.—Two small pieces of thin sheet rubber of dark brown colour. The rubber was strong and exhibited greater elasticity than No. 4.

Its composition was found to be as follows :—

	Per cent.
Moisture	0·9
Caoutchouc	91·9*
Resin	2·9
Saccharoid substance	1·3
Proteid	2·8
Ash	0·4

*Including 5·7 per cent. "insoluble caoutchouc."

No. 6.—Two pieces of thin sheet rubber, dark brown in colour and rather moist. The rubber resembled No. 4 in physical properties.

The results of the analyses were as follows :

	Per cent.
Moisture	5·6
Caoutchouc	88·0*
Resin	2·8
Saccharoid substance	1·0
Proteids	2·3
Ash	0·3

* "Including 1·6 per cent. "insoluble caoutchouc."

It will be seen from these analyses that the percentage of resin in the three samples, when corrected by the determination of the amount of the saccharoid subtance which was previously included as "resin," are practically identical, *vix.*, 2·6, 2·7 and 2·8 per cent., and within the usual limits for Pará rubber. The amount of moisture present is rather variable, 3·5, 0·9 and 5·6 per cent., and also the percentages of "insoluble caoutchouc" 4·8, 5·7 and 1·6 per cent.

In the absence of full information respecting the origin and preparation of these samples it is not possible to discuss the results fully.

The New York Exhibition and Plantation Opportunities.

Mr. Staines Manders is back in London after his trip to New York to arrange for the Exhibition which is to be held in that city from September 23 to October 3 next year. He and Miss Fulton, the Secretary, will have their hands full during the next few months organising this new tribute to the rubber industry. It is not without significance that just now, with the Exhibition in view, the "*India Rubber World*," of New York, should publish an editorial entitled "What Higher Rubber means." The "*India Rubber World*" says :—"At no time in the history of the rubber trade could rubber manufacturers view a fifty per cent. export duty on Brazilian rubber and a restriction of the acre product with greater calmness. Factory stocks have accumulated, reclaimed rubber is understood and manufactured on a greatly increased scale here and abroad, plastics, such as mineral rubber, are utilised the world over, and plantation receipts are constantly growing. If Brazil does as she plans, as the certainly has every right to do, rubber will undoubtedly be higher for a time. The result, however, will be a tremendous increase in planting, a further exploitation of the lesser rubber producers, the substitution of many plastics for rubber wherever it is possible, and the final disappearance from the market of all wild rubber, the cost of collection of which is above 50 cents. a pound." There is no mistaking the point of this note. American manufacturers have to interest themselves more closely in plantation rubber, and *per contra* the plantation companies must interest themselves in New York.—*The Rubber World.*

Smoking of Rubber.

DUTCH EXPERT'S OPINIONS ON THE METHODS ADOPTED.

The smoking of rubber quite recently came up for discussion at a congress of rubber planters held at Bandoeng (Java). During the debate it was clear that nobody had much experience about the matter, and it might, therefore, be of interest to hear what Dr. K. Goeter writes. The following is taken from the *Sumatra Post* :

As is well-known, says the doctor, Pará Rubber is obtained in a different way to plantation rubber. Then follows a description of the method adopted in Brazil for the preparation of rubber. The writer proceeds : It is however, most noticeable, and according to the experiences of Trillat and other investigators, that wood smoke contains another substance (besides creosote) having strong conserving properties, namely, formaldehyde, which dissolved in water is the formaline or formol of commerce. It was, therefore, thought probable that this stuff would be found in small quantities in smoked rubber. This was indeed found to be so. With the help of various sensitive reactions, I could undoubted show the presence of formaldehyde in smoked rubber sheets, so that by reason of this result it may be taken that the conserving work of smoke on rubber must at least be partly attributed to the presence of formaldehyde in the smoke. In the development of smoke it would be well to bear this in mind by endeavouring to get a smoke that is as rich as possible in formaldehyde.

Now it has been found that organic substances, for instance, sugar, will through incomplete combustion, produce more formaldehyde, when they are placed in contact with a metal, such as iron, will give a smoke with a higher percentage of formaldehyde than when that contact with a metal does not exist. This seems to me important enough to revert to the subject again by and by. First I shall particularly direct attention to the fact that smoke is caused by incomplete combustion, in other words by a limited supply of air. On this point it has appeared to me that, in practice, the air is not sufficiently impeded. The wood must smoulder, therefore it must burn without flame and this is only attained by limiting the admission of air. If there is too much air, less smoke is obtained and more fuel is used up; so that it is less economical from two points of view. It was tried to remedy this by smoking the fuel wet, but this was a wrong procedure because it brought more vapour (acqueous) into the smoking room. As a result of that the rubber took necessarily a longer time to dry. Besides under these circumstances, more tarry products were developed through which one ran the risk of getting a foul tarry deposit forming on the rubber that would spoil the outward appearance and so the quality of the rubber. Finally, it might be well also for planters to bear in mind that in smoke, a poisonous gas, the well-known carbonic oxide, is formed, of which the relative quantity increases under the last-named conditions. From a hygienic point of view the health of the coolies working continually in an atmosphere of smoke should be considered. Yet for a uniform smoking it cannot be avoided that the hanging sheets of rubber have to be regularly turned about. In any case proper ventilation should be seen to by having the windows wide open.

Whether smoking has a direct influence on the physical properties, for instance, or the elasticity of the product, I should not dare at present to decide. As a fact, it can only be said now that smoked rubber keeps better and is not so liable to mould as unsmoked rubber. As a rule a higher price is paid for smoked rubber on this account. As to how smoking should be done, opinions differ. Mr. Ridley, Director of the Botanical Gardens in Singapore, gives his experiences on this point in the *Agricultural Bulletin of the Straits*, from which I take the following (here follows a description of Mr. Ridley's process, noting in particular that he used a wooden house with an attap roof.)

Then the doctor continues:

The vapour and the tarry substances of the smoke are practically fully absorbed by the woodwork and the attap, so that the rubber is not covered with a foul damp substance. Compared with this, the experiences of others using a stone house with a galvanized iron roof and into which the smoke is led from without, were less favourable. In this case there was a deposit of tarry substances on the floor and every part of the building and even on the rubber. This trouble does not occur in a wooden house; although the woodwork becomes dark-brown and even black by the precipitations from the smoke, the rubber remains dry under these circumstances and of good colour. No other ventilation than through the crevices is necessary. Only when men have to go into the smoking room care should be taken to throw the windows open. Generally the door is left open, but as this is at the lowest end of the building, the draught drives the smoke through the rubber to the higher end of the building. Cocoanut husks may be used as fuel instead of wood, but cocoanut husk and also saw dust produce sparks which fly up and deposit themselves on the rubber as bits of wood charcoal. Experiment for improving the smoking process by the addition of creosote had not the desired favourable result.—*Tropical Agriculturalist.*

TEA.

The Tea Trade with Australia.

Mr. Copland Mackie, of the Eastern Export Proprietary Ltd., returned to Ceylon on the 8th November, after spending five months in the firm's branch at Melbourne. Seen by a representative of the *Times of Ceylon*, Mr. Mackie said the present outstanding feature of the tea trade with Australia was the keen competition for the business, which was gradually being acquired by a few expert firms, who had been in the trade for many years and had made a close study of it. He said that during the past few months the market had been fairly satisfactory to importers. There seemed to be an inclination amongst consumers to go off common grade teas in favour of better class tea. The lower grade teas generally had been adversely affected by the competition of Java teas. Contracts made twelve months ago for teas at the then ruling prices were still being carried out, but he thought that after January when fresh contracts had to be made considerably less business would be sent to Java. Java teas were now costing quite as much as Indian and Ceylon teas, and unless Java teas could be procured at a half-penny or three farthings a pound less than Indian or Ceylon the Australians did not want them. They were not popular teas excepting where there was a considerable saving in price.

In Nyasaland.

The area under tea in Nyasaland increased from 518 acres in 1910 to 1,190 acres in 1911. There is only a very small acreage in full bearing, but the healthiness of the crop and the sureness of its return are making tea cultivation popular with planters, and there is a very keen demand for land in the tea district. The local tea has greatly improved in quality since the introduction of proper firing machinery. Small estates cannot bear the cost of expensive machinery, but a company is now erecting a large factory, at which will be carried on the making and packing of tea from its own and adjoining estates.

Abnormal Dearness of Common Tea.

The *Grocer* of October 21st reports :—Despite the heavy Indian auctions the tea market exhibits great strength, more particularly for grades below 9½*d.* (of which there is a shortage). Common leaf stands at 8*d.* to 8¼*d.*, with comparatively little at the former figure, and is about 1¾*d.* per lb., dearer than at this time last year. Imports of all kinds of tea into the United Kingdom during the first nine months of the present year are about 3½ million lbs. in excess of the same period of last year, while deliveries for home use are 4 millions larger, and the present stock is nearly 7 millions less than in 1910. The position is quite abnormal, and supply does not keep pace with the demand. The usual dearness of common tea has caused freer movements of China tea, both imports and deliveries having decidedly increased this year. The weather in Ceylon is now more favourable for production, a larger export to this country being estimated for October, and it is hoped that the shortage in crops will be much smaller at the end of the year than was anticipated. Exports from Northern India to the United Kingdom since the beginning of the season to October 15, are over 10½ million pounds more than in the same period of last year. As this increased quantity comes upon the market, it will be interesting to see whether present rates can be maintained. The present high rates of the lower grades of tea are exceedingcy unremunerative to all distributers. If prices eventually decline somewhat the movement will be generally welcomed by the trade.

The Planters' Chronicle.

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(INCORPORATED.)

The Scientific Officer.

In all probability Mr. R. D. Anstead will be back from Pusa about the first week in December.

The Tea Campaign.

Reviewing tables recently published by the Board of Trade, showing Imports and Consumption of Tea, &c., the *Produce Markets Review* observes that one point brought out by the official figures "is the complete failure of the tea propaganda by our Indian and Ceylon planters in Germany, the Continent generally, and the United States." The London paper goes on to say:—"Our planters had far better spend their money in putting the British trade on a proper footing once more. The pushing of the commonest tea as 'the finest' by unscrupulous advertisement has reached a point full of the gravest peril to the interests of our planters, on whom indeed the cost of mendacious advertisements must ultimately fall. The legitimate tea trade is reduced to a state bordering on ruin, while its supplanters sell it at something like first cost, making up their profit from other things and using tea as a bait. This is a scandalous position calling for vigorous action, but little is done. Things are indeed getting to a wretched point, but something is being effected by the action of the Fine Tea Fund, to which the Indian and Ceylon 'cesses' could very advantageously be transferred, if the planters realised their true interests."

However, the consumption of Tea in the United Kingdom has gone on increasing; and there is no ground for the belief that the British retailer has not benefited by the expansion of this trade.

Tea, Coffee and Chicory.

The same contemporary is responsible for the following remarks:—"The Anglo-Saxon race in the British Empire have for generations been the chief tea drinkers of the world, and among the smallest coffee-drinkers. In the United States the proportionate consumption of the two beverages are reversed, probably because of the large proportion of inhabitants of continental extraction which they now contain. We and our fellow-subjects will not take the little trouble required to make coffee, and most of us have bowed the knee to that useless substitute chicory, against which the natural system turns after a time, as it is neither nutritive nor nice."

It is satisfactory to note that Trade papers at Home are urging sales of *good* Tea and pure Coffee. The former commodity has, at least, not to enter into competition with "substitutes" masquerading under its own name with slight variations. To that extent it has an advantage over Coffee, which is in urgent need of a vigorous propaganda.

SECRETARY'S PAPERS.

III.—"Coloured" Tea in the United States.

Go too far to the West, and you arrive in the East. Some of the authorities in the United States in their efforts to reach the Sublime have arrived at the Ridiculous. The Tea Board has ruled that no tea that has been artificially coloured shall be imported into the country. The same Tea Board, some months ago, selected "Standards" of teas that should be allowed to pass the Customs, and among these were some "coloured" or "faced" teas.

The new ruling was aimed at Green Tea, but has hit some Black Tea also.

From Shanghai it has been reported that if the exclusion ruling is fairly administered, not a package of China Green Tea will be allowed to be imported into the United States. A good deal of China Black tea will also be excluded.

In American trade circles the ruling seems to be welcomed, conditionally on its being enforced with equality at every port of entry. (There are very strong complaints that the "standards" are not enforced with such equality). Yet there is a sort of feeling that makes some dealers exclaim:—"Oh, this is so sudden!" The shock, whether pleasant or not, is none the less a shock. Moreover, dealers fully realise that enforcement must mean a rise in prices. A meeting of the Tea Association of New York was convened for the purpose of considering the matter. The following statements were made in the notice of the meeting:

"It is generally understood from the various advices received from Shanghai that all or most of a large quantity of green tea—Country Greens and Ping Sueys—brought down to and now for sale on the Shanghai market, contains some percentage of colouring matter.

"If these teas find a market for shipment to the United States it is evident that the Chinamen will still continue to bring down green teas more or less coloured. It is believed that such a result would be disastrous to the United States green tea trade, and to prevent such a condition it has been suggested that the Tea Association of New York take this matter up with the Department at Washington for the purpose of obtaining a proper enforcement of said regulation by a stringent exclusion of all teas which upon analysis or microscopic investigation show the presence of any artificial colouring matter.

Already, the Treasury Department at Washington has ordered the delivery to consignees of about 1,000,000 lbs. black tea that had been held up at San Francisco for several weeks as containing artificial colouring matter. A similar quantity of green tea, held up on the same charge, was ordered to be refused entry; but is understood to have been released after a detention of several weeks, which caused great congestion in the local market. The ruling of the Treasury Department was on the ground that black tea was merely "faced" with colouring matter which did not permeate it, while the green tea was permeated by the colouring matter. Each shipment was valued at £50,000. Of course, the decision arrived at opens the way for a series of disputes in the future, and makes the trade uneasy. But, to judge from the latest reports, there is a fair prospect of Japan teas being admitted, and many China grades shut out. Indian teas ought to benefit by the extra strictness that is contemplated, provided that the rules are applied fairly.

DISTRICT PLANTERS' ASSOCIATIONS.

Wynaad Planters' Association.

Proceedings of a Meeting held at Meppadi Club on November 8th, 1911.

PRESENT :—Messrs. Bownass, Darkin, Howland, J. C. Parker, Powell, Winterbotham, Mr. J. C. Stewart (by Proxy) and Mr. C. E. Abbott (Honorary Secretary.) Visitor: Mr. Briggs. Mr. Bownass in the Chair.

1724. THE PROCEEDINGS OF LAST MEETING were confirmed.

1725. NEW MEMBER.—Mr. J. Macbain was elected.

1726. DELHI DURBAR CELEBRATIONS.—Read Government Order. Read letter from Secretary of the Executive Committee, Vayitri, *Resolved*: "That Mr. J. Carson Parker and Mr. Powell be appointed a Committee of the Association to confer with the Meppadi Committee and to collect subscriptions from members." Resolved also: "That Rs.50 be paid from Association funds for the celebration."

1727. ROADS.—Read letter from Mr. Blake acknowledging Honorary Secretary's letter forwarding Mr. West's about Road 35. Read letter from Mr. A. H. Jackson, complaining of the Coorg-Kortikottam Road, and letter from Mr. Blake, stating that the matter will be attended to.

1728. NON SERVICE OF WARRANTS.—Read correspondence between the Hon'ble Mr. J. G. Hamilton and the Honorary Secretary regarding the cases mentioned in para. 1721. In the case brought forward by Mr. Bownass and which the Wynaad Delegate referred to during the discussion on this subject at the recent Bangalore Meeting, the accused has been arrested. Nothing further has happened so far in Mr. Waddington's case. Read letter from Mr. West about Shengalli Maistry, against whom two warrants have been issued and returned, as the Police could not find the man in his village. Meanwhile the accused has written from his village sending Mr. West a Money Order for part of his advance. The Honorary Secretary was instructed to ask Mr. West for some further details.

1729. LABOUR LAW.—Read letter from Mr. Nicolls asking the Association, for reasons stated, to reconsider its decision about cases 209 and 210 in para. 1720 October Proceedings in which Mr. Nicolls considered the punishment awarded by the Gudalur Magistrate inadequate. Read Honorary Secretary's reply asking what action the Nilgiri Association had taken. Resolved: "That in the absence of Mr. Nicolls the Meeting adhered to its former decision."

1730. MEMBERSHIP.—Read letter from Mr. Nicolls and Honorary Secretary's reply, drawing attention to the rule passed at the Meeting of October 12th, 1910. It is proposed to discuss this question at the December Meeting.

1731. MEDICAL.—Read letter from the President, District Board, inquiring about the arrangements made by planters to provide medical attendance for coolies, and the Honorary Secretary's reply. Read letter from Mr. Stewart suggesting that we ask Government to appoint a qualified medical man at Meppadi. The Honorary Secretary was instructed to write to Mr. Stewart for further particulars.

1732. ARRACK SHOPS.—Read letter from L. A. Canimeade, Esq., Divisional Officer, with schedule of independent Arrack Shops to be leased in 1912-1913; asking if the Association has any objection with regard to the location of any of the shops. It is noted that the test is that for April 1911,

so it is presumed that no changes are contemplated. The only objection that was taken by the Association last year was to a shop moved to near Mr. Atzenwiler's property, which the Divisional Officer at once closed. The Meeting had no suggestions to make as long as the shops remain where they are. A member made a complaint about the disorderly scenes which take place outside the Chundall arrack shop.

1733. CATTLE DISEASE.—The Honorary Secretary stated that he had a visit from Mr. P. V. Ramaswamy Iyer, Veterinary Assistant, who had been investigating the recent outbreak of disease among the buffaloes in Mupenaad. He says this was not anthrax. He promised to do what he could to prevent the sale of hides and carcases of diseased animals, which is a criminal offence. (para. 1710, August proceedings). He recommended a good supply of rock salt for all estate cattle.

1734. INDIAN TEA CESS COMMITTEE.—Read circular 65/11 U. P. A. S. I. The next Meeting of the Committee will be held in January 1912, and those who have any suggestions should communicate with the U. P. A. S. I. representative, Mr. J. Carson Parker.

A vote of thanks to the Chair terminated the Proceedings.

(Signed) W. EVERETT BOWNASS,
Chairman.

(„) C. E. ABBOTT,
Hon. Secretary.

In the course of an article on the 'Expansion of British Influence in the Malay Peninsular' in the October number of *United Empire*, the Journal of the Royal Colonial Institute, it is stated:—

" There are upward of twenty-four mining and agricultural concessions in the State, but, as there is no proper survey, their extent is unknown. Most of these are held by natives, but some are in the hands of British subjects, some of Chinese, and one concession of 6,000 acres is held by a Japanese for planting purposes. Before long Trengganu will have to be added to the list of countries exporting rubber. The natives, however, have not yet taken seriously to planting Pará rubber, though the Sultan, like a wise ruler, leads the way with a plantation of about fifty acres at Batu Lambong, on the Nerus River. The country appears to be suitable for rubber planting, with a yearly rainfall of over 100 inches. The temperature ranges from a minimum of 71° in December to a maximum of 93° F on September, the greatest range (21°) occuring in the latter month."

" At the close of the year there were twenty-three rubber estates in Kelantan, covering an area of 64,290 acres. Of this 5,402 acres were planted in rubber and 1,158 were ready for planting. Many of the managers confined their attention during the year to cultivating the area opened up, with the result that many of the estates compare favourably with the best-known estates in the Peninsula and exporting was begun. There was a large importation of Chinese labour for estate purposes, and Chinese labour now exceeds in number that of any other nationality. The British Adviser and the Residency Surgeon visited every estate during the year and saw every coolie, and report favourably on the health conditions."

CORRESPONDENCE.

Tea in 1910-11.

Sir,—The increase in the consumption of tea throughout the world, which we have pointed out in our annual review of the history of the tea trade for some years past, continues. At the present time, instead of planters having to sell their tea almost for anything they could get, and to tax themselves in order to exploit new markets, as was the case from ten to five years ago, the demand for British-grown tea is greater than the supply and prices have been paid this year for common tea which have not been equalled for twenty years. The average price of all tea has also risen considerably.

Rather more than four years ago, as we pointed out in our annual letter in 1907, consumption overtook supply. Prices thereupon rose, and the planter, after a time, began to reap some slight reward for his long years of hard, almost unremunerative toil, and for his persevering efforts to find new markets for his teas.

Since then production has continually increased, but consumption has increased still faster and is now distinctly in advance of supply. We say in advance of *supply*, rather than of *production*, because in all probability large quantities of tea are grown and consumed in all the producing countries, particularly in China, of which no record reaches the outside world.

The proportion borne by the various countries in supplying the world's demand remains much the same as last year, all of them having increased their output except Ceylon.

By far the greatest part of the tea concerning which we have reliable statistics is grown in India and Ceylon, most of the rest coming from China, Japan and Java. Small quantities are grown also in Natal, Nyasaland, Burma, the Straits Settlements, the Mauritius, Queensland, the Fiji Isles, Brazil and the Caucasus, but are almost entirely consumed locally; some also in Annam, part of which is exported to France.

India produced a record crop during the year 1910-11, her exports up to May 31, 1911, to which date we have official figures including Southern India, reaching the large amount of 258,384,800 lbs., about 4,000.000 lbs. more than the preceding twelve months. It seems probable that when we see returns for the twelve months ended September 30, we shall find that the increase is even greater, and that the crop of 1910-11 is as much as 15,000,000 lbs. ahead of that of 1909-10.

The following table gives the distribution of Exports from India during the last four years :—

	1910-11. lbs.	1909-10. lbs.	1908-9. lbs.	1907-8. lbs-
United Kingdom ...	174,100,700	180,083,200	168,093,400	161,438,400
Australia ...	9,595.900	8,604,800	8,936,800	10,946.200
America ...	5,606,900	5,609,900	5,500,500	3,744,300
Russia and China ...	40,347,500	30,490,500	25,443,100	27,755,600
Other Ports ...	10,478,800	10,849,500	12,877,800	9,837,700
Total from Northern India ...	240,129,800	235,637,900	220,851,600	213,722,200
Southern India ...	18,255,000	16,616,000	15,243,100	15,262,400
Total from all India ...	258,384,800	252,253,900	236,094,700	228,984,600

Russia and China are coupled together in this table, because practically all the tea sent from India and Ceylon to China consists of dust and siftings

which are manufactured, in factories belonging to Russian firms, into "brick" tea, for consumption in Asiatic Russia.

A statement appeared in a Chinese newspaper last February to the effect that the Chinese Minister of Trade intended to stop the importation of foreign tea into China. This would have been injurious to the Indian and Ceylon planters, who are in the habit of sending to Hankow every year about 15,000,000 lbs. of dust and siftings to the value of about £400,000. It was not, however, necessary for them to move in the matter, as the rumour was not confirmed.

It is said that the factory owners protested through the Russian Ambassador against the proposed course, and even threatened to remove their factories from China. The admixture of about 10 per cent. to 15 per cent. of the strong liquoring dust from India and Ceylon greatly improves the "bricks" and facilitates their sale.

The area under tea in India has not much increased during the year; the difficulty of obtaining coolies is so great that most planters now devote their attention rather to increasing their productive power of the existing gardens than to extending their area.

Up to the end of 1910 the total export from *Ceylon* had fallen over ten million pounds. During the early months of this year it recovered considerably, but not sufficiently to bring the total nearly up to the record output of 1909-10, which was very little short of 192,000,000 lbs. The deficit is attributed partly to the drought and partly to the greater attention given to rubber.

Some experts think that with favourable climatic conditions the output of the island will remain at about the same level for some years to come, for although the increase in rubber planting tends to reduce the area under tea, better cultivation increases the yield. Also there is much high ground in Ceylon very suitable for tea, where rubber cannot be grown. About 61 per cent. of Ceylon's crop goes to the United Kingdom, the rest mostly to Australia, Russia and America.

There is a growing opinion in Ceylon that there is an excellent opportunity just now for establishing a good trade with the United States in natural green teas, to take the place of the coloured teas formerly imported from China and Japan. Ceylon has paid increasing attention to green tea the last few years (a new and well equipped finishing factory is now in course of erection at Colombo), with the result that during the year under consideration 15,000,000 lbs. more of it were exported from Ceylon to America than in 1909-10. It is expected that a good deal more green tea will be made in the island during the current year.

The great feature of the year with regard to British-grown tea, both Indian and Ceylon, is the immense increase in direct shipments to foreign countries, particularly to Russia. Many Russian merchants who formerly made their purchases in London, now buy almost entirely in Calcutta and Colombo.

Owing to the drought, it is probable that the output of *Natal* tea will be about 50,000 lbs. less this year than last, *viz.*, 2,042,000 lbs. instead of 2,092,000 lbs. The demand for this tea increases steadily. If the output were doubled, the whole would probably easily be consumed in South Africa. So far, though, from there being any prospect of a substantial increase in the crop, it seems as if, owing to the scarcity of labour, the planters would have a difficulty in keeping it up to its present level.

Until this summer the greater part of the work has been done by indentured labour from India, but the Indian Government last June refused to allow any more coolies to go to Natal. Local labour is almost unobtainable, as tea cannot pay the high wages offered by gold and other industries. It has been suggested that men should be brought from Nyasaland, but even if that were practicable, they would cost twice as much as Indian coolies. One writer on the subject thinks that the tea and sugar industries of Natal will soon be things of the past, but that is hardly likely.

It is estimated that there are about 20,000 acres of land in *Nyasaland* suitable for tea growing, of which about 600 are at present under tea, while there is an increasing demand for land round about the existing gardens. Some of the land is leased by Government at 6*d*. an acre, some sold outright at 10*s*. Last year's output was about 56,000 lbs.

The aroma and flavour of the tea are said to be very good, superior to low-country Ceylon. Tea promises to be very profitable in Nyasaland, as labour is cheap, the natives like the work, and the tea area is within twenty miles of the Shiré Highlands Railway.

Exports from *China* increased on the whole during the year. Shipments to the United Kingdom and to Russia rose, but the United States took 23 per cent. less green and 71 per cent. less black tea than during the preceding year.

The trade with the United States has been affected by the new regulations, which came into force in May 31, 1911, forbidding the importation of artificially faced or coloured teas, of which until this year about 15,000,000 lbs. have been annually shipped to the States from Shanghai.

In spite of the publication of this law, about 40,000 chests of coloured tea were manufactured and sent to Shanghai for exportation. Some of it was actually shipped to the States, but was rejected as impure. It has been suggested that possibly the manufacturers did not take the prohibition seriously, or thought that the authorities would be induced to relent.

The production of tea in *Java* increases steadily, though not rapidly, but the total output is still so small compared with that of India and Ceylon, that it does not make much difference, so far as satisfying the world's demand is concerned. In Java, as in most of the other tea-producing countries, production is hampered by the labour difficulty, the supply of native labour not being sufficient for both rubber and tea, and the Government putting difficulties in the way of importing Chinese labour.

During the year exports to the United Kingdom and Australia increased considerably, but less was sent to the Netherlands. The United Kingdom and the British Colonies take about 40 per cent. of the whole amount exported.

Exports from *Japan* increased during the year, but not to any great extent. The quality of the leaf is not as good as it has been. Machinery is now generally used and has not been brought to sufficient perfection to turn out as good tea as was formerly made by hand.

When the United States passed the law forbidding the importation of coloured tea, a regulation was issued by the Japanese Government prohibiting the manufacture or handling of such tea in Japan. As, however, Canada gave some large orders for tea of this kind, the Government decided that the regulation should not come into force until September.

Formosa produces about 24,000,000 lbs. a year. The tea is different from all other teas, being partly fermented and therefore something between a black and green tea. It is principally used for flavouring. The best kinds

are highly valued. The first crop of this year is reported as being of exceptionally good quality.

The amount of tea grown in the *Caucasus* does not affect the world's supply, though the quantity is steadily increasing. The tea can be delivered in St. Petersburg at a cost of about 2*s.* a pound.

Experiments in tea growing have for some time past been made in *Brazil.* A sample lately received in London was of excellent quality, resembling good Ceylon. Possibly at some future time the shortage in the world's tea supply caused by the inter-planting of rubber in the old tea-producing countries of Asia, may be supplied from the rubber districts of Brazil.

The tea grown in *Burma* is almost entirely made into *letpet* (pickled tea) and eaten as a condiment. It therefore does not affect the world's supply of tea for drinking

Turning from the consideration of the *production* of tea throughout the world to that of *consumption*, we find that it also, as we said above, has considerably increased,

In the United Kingdom consumption per head of population has risen to 6·39 lbs. higher than in any other part of the world except Australasia.

The followtng table shows the amount contributed by the various producing countries in supplying the tea consumed in Great Britain and Ireland during the last two years, and the proportion these amounts bear to one another. The figures are those given by the President of the Board of Trade in the House of Commons on August 8 last :—

	Year ended June 30. 1911.		Year ended June 30. 1910.	
	lbs.	percent-age.	lbs.	percent-age.
British East Indies (except Ceylon) ...	164,456,000	57·00	149,885,000	54·68
Ceylon ...	91,098,000	31·58	95,083,000	34·69
China ...	12,192,000	4·22	8,834,000	3·23
Java and other Countries ...	20,757,000	7·20	20,303,000	7·40
Total ...	288,503,000	100·00	274,105,000	100·00

Russia continues to be India's best customer outside the United Kingdom. Her whole population, over 120,000,000, drink tea and drink a good deal of it. They are gradually giving up China tea and taking more from India and Ceylon. There has been a succession of very good harvests, causing consumption by the peasantry to increase.

It is possible that their buying power may diminish a little this year, as the harvests in several districts are not good, but this is not likely to make much difference in the total amount imported. Official statistics show an increase of 7,110,000 lbs., or 29·6 per cent., imported from India, during the year ended March 31, 1911. The increase from Ceylon is estimated, to July 13, at 1,400,000 lbs. Calcutta has now a direct steamer service to Russia.

During the year under consideration, *Australasia* took about 750,000 lbs. more from India, rather less than usual from Ceylon, and a good deal more from Java, than during the preceding year.

In the *United States* there is no doubt that tea is gradually, though slowly, coming into favour. This has probably been partly caused, lately, by the high price, of coffee. During the year under consideration the States imported over 20,000,000 lbs. of British grown tea, in the proportion of about 12,000,000 from Ceylon and over 8,000,000 from India.

As we remarked when speaking about China tea, the prohibition of the importation of coloured tea into the States will probably have the effect of increasing the consumption of British-grown tea. The new regulation will doubtless raise the standard of the tea imported. Until this law came into force a certain amount of "scum," *i.e.*, floating colouring matter, was allowed, but will be permitted no longer. This, will be to the advantage of Indian and Ceylon green teas which are absolutely free from colouring matter.

On the continent of *Europe* tea-drinking is increasing generally. The increase in the consumption of Indian tea is particularly marked in *Belgium*, doubtless owing to the good work done at the Brussels Exhibition, which will no doubt be carried on at the three Exhibitions at Dresden, Turin and Charleroi.

Complaints are still made that it is difficult to get good tea in *France* (though a French paper said a little while ago that Paris had gone tea mad) except at the very best hotels and cafés, where very high prices are charged. The fault is doubtless a good deal in the making, but is also due to the quality of the tea itself.

The greater part of the tea consumed in France comes from Annam, and is of very poor quality, but as it comes in duty-free, while other tea has to pay a tax of 11¾ a pound, it is naturally cheaper in proportion. Also French merchants frequently buy their tea by the appearance only, without tasting it, so that even if they buy it in England they often do not get tea likely to give what an Englishman calls a "good cup."

It is extremely difficult, practically impossible, to get reliable statistics as to the consumption of tea in *India* itself but there is no doubt that it is increasing. It is estimated at from 7,000,000 lbs. to 12,000,000 lbs. a year, but these figures are more or less conjectural. The natives are certainly taking more, and many native traders are interested in the trade.

We think that the above details prove that the position of the tea producer is happier than it has been for many years past, though his life is far from being an idle or even an easy one, nor is it by any means free from cares or anxieties.

The position of the distributor is not at the present moment quite as happy. He has on the one hand to pay high prices for his teas, and on the other to satisfy consumers accustomed for years to pay very low prices for really good tea. He suffered this spring, as usual, from the dislocation of trade which takes place yearly before the declaration of the Budget, owing to the anticipation of a change in the duty. This year, also, the strike greatly interfered with his trade, tea being affected by the stoppage of work at the Docks as much as any commodity and more than many.

Nevertheless, in spite of all these drawbacks, the trade continues to be in a fairly flourishing condition, both with regard to production and distribution, tea being considered by most people, in spite of all that has been said to the contrary, a necessity of life.

BROOKE, BOND & CO., LTD.

London, October 26.

CAMPHOR

Artificial and Natural.

After the discovery of Synthetic Indigo came that of Synthetic Camphor; and the temporary success of the one in the field of commercial competition stimulated fears that the other would also oust its natural rival from various branches of employment. Since then, there has been, in the case of Indigo, a reaction towards a preference for the natural product; and as regards Camphor difficulties have cropped up which were at the outset unanticipated. In spite of this, however, the shadow of Synthetic Camphor may be said to cast a gloom over the hopes of many producers of, and dealers in, the genuine commodity which held its own, unchallenged, for centuries. There appears to be very little reason for fears of the kind referred to, as will be seen from the following recapitulation of some past writings on the subject.

Last year, M. V. Cayla contributed to the *Journal d'Agriculture Tropicale* an article in which the position was considered regarding the likelihood of the entry of artificial camphor into serious competition with the natural camphor. M. Cayla, after giving evidence from various authorities to the effect that such competition is not likely to exist, drew attention to one of the chief reasons for this, namely, the high price of turpentine, which is the raw material required for the production of synthetic camphor. Although this price subsequently became 60 per cent. less than that in 1907, even under such favourable conditions the aritificial product could not be made profitably. Another factor also made itself felt, *viz.*, the lowering in the price of the natural product. It was certain that this, which had reached the level of 4*s.* 10*d.* per lb. in March 1907, could not remain as high for long. It was partly due to an attempt to make a monopoly of the production, with the result that the manufacturers of celluloid, and other consumers of camphor, renewed their efforts for the cheap production of synthetic camphor. This led the Japanese Monopoly to lower its price, and it was also compelled to do this in order to get rid of the large stocks on hand.

There are other considerations besides those mentioned that have helped to discourage the production of artificial camphor. Among these is the fact that its quality is not as good as that of natural camphor. so that it is usually quoted at 1*d.* to 2½*d.* per lb. below natural camphor, because it can only be nsed in a limited way for the production of articles of inferior quality. On the other hand, there is evidence that means have been found for purifying artificial camphor from the free chlorine that it used to contain; though the fact that this has to be done must increase the cost of manufacture.

Attention was drawn by M. Cayla to the fact that those who encourage artificial production draw a parallel between the conditions that are likely to exist in the camphor industry and those that have obtained in the indigo industry, whereby the growers were forced to give up cultivation on account of the appearance of the cheap manufactured article. It was held that the circumstances are not parallel, on account of the difference in the conditions of production: the Japanese possess special knowledge in regard to the distillation of camphor, as well as information that is not generally available as to the cultivation, exploitation and refining of the product.

Later, the competition of artificial with natural indigo developed weak points; and these afford fresh ground for arguments to the effect that artificial camphor can never hope to enter into more than *partial* rivalry with the natural article.

When the article under reference was written, the only recent certain facts were that increased areas were being planted, which were controlled by the Japanese, not only with the true camphor plant but with Borneo camphor (*Dryobalanops camphora*), and species of *Blumea*; that new camphor forests had been discovered in the Japanese archipelago: that Japan had gained a complete victory in its struggle against Chinese camphor; and finally, that the desire on the part of the Government to continue to rule, the market was making it show a disposition to forbid the sale and exportation of camphor seed.

M. Cayla observed that, as the question is, therefore, only concerned with the natural product, it becomes solely a matter for considering how long the forests that are now being exploited in the Japanese Empire will last, and when the young plants will be ready for employment in production. If the old method of cutting down the trees continues to be adopted, the younger cultivation cannot be useful before a period of thirty years has passed; and the further question is suggested as to whether the supply from the existing forests can continue for such a time. This leads to the consideration of work that is being done, particularly by the English in several parts of their Asiatic possessions, as well as in the West Indies, for the purpose of discovering if camphor can be produced remuneratively by the distilation of the leaves only. In connection with this, the article from which these facts are being taken refers to investigations made at Batu-Tiga, Selangor. These experiments show that trees five years old, and probably those which are younger, yield leaves in regard to which at least 1 per cent. of camphor, as well as a certain quantity of oil, can be obtained from the fresh material. Information is given, further, in the article in the *Journal d'Agriculture Tropicale*, with respect to another experiment which was undertaken by the same investigators, in order to find the yield of camphor from the different parts of a whole plant five years of age. The results were to show that the following percentages of camphor were obtainable: leaves 1·00, twigs 0·22, large branches and wood 0·66, roots 1·20. It is pointed out that these results show completely that, other than the roots, which cannot be considered as being exploitable, the leaves have the chief interest in regard to the production of camphor, and there is the further result of the work, namely, that distillation is only required, for these, for three hours. Attention is also drawn to Bamber's suggestion to bruise the leaves and twigs thoroughly, before distillation. Reference is made to similar experiments that have given comparable results in Jamaica and Antigua. Experiments on a larger scale, conducted at Kuala Lampur, in which a plantation of camphor trees about eighteen months old and 5 feet in height was thinned in order to make room for the remaining plants, gave 1,226 lbs. of material for distillation per acre, which furnished 0·6 per cent. of camphor.

In concluding, the article refers to the fact that all these investigations show the possibility of obtaining camphor from the leaves, and suggests that in the future the circumstance that such a long time must elapse before camphor can be obtained from trees that are cut down, will cause the abandoment of this method for that in which the leaves alone are employed.

There was a very small exhibit of Mysore Camphor at the Mysore Exhibition this year, and it would be interesting if planters who have experimented with this product in South India would give some particulars regarding yield, methods of preparation adopted, etc. A comparison of "notes" of this kind would probably be very useful and instructive.

RUBBER

Difference between Amazons and Plantation Rubber.

In the *Bulletin Mensuel de la Chambre de la Cochin-Chine*, July 1911, p. 479, M. Vernet commences a series of articles on the preparation and commercial value of the different sorts of Crude Rubber; that is, the crude rubber of *Hevea braziliensis.* After a general introduction he proceeds to point out that wild Pará rubber is actually valued more highly than Plantation Pará. This he shows to be the case by giving the values of the two forms at the date March, 1911, as being 17 francs 50 for wild smoked Pará and 10 francs 25 for very pale crepe, and, as the wild Pará when treated gives 82 per cent. of commercial washed rubber and the pale crepes 99 per cent., the value of the Wild Pará when washed gives 21 francs 34, as against 18 francs 43 of crepe.

The reasons for this difference in value he attempts to investigate.

The principal factors which are of importance to manufacturers in dealing with rubbers of different kinds are (1) their output in commercial rubber washed and dried, and (2) the actual value of this washed rubber.

To obtain the output of commercial washed rubber, the crude rubber is first weighed and then washed in a flow of pure water as it passes between a series of rollers, moving at different rates of speed. The result is "washed rubber" and the difference in weight between it and the crude rubber represents the loss in washing.

M. Vernet proceeds then to give the loss by washing of the various forms of cultivated and wild rubbers.

Cultivated Pará, No. 1 Crepe, biscuit, sheet or block, as made in the factory. This varies, pale crepe giving a loss by washing of ½ to 1½ per cent., while biscuits give a loss of 3 to 4 per cent.

No. 2. Clot or as he calls it Lump—the rubber which has coagulated in the cups—which is always, he says, more or less stained with organic débris (it should not be) gives a loss of 5 to 30 per cent., but when made up as crepe, only 2 to 3 per cent.

No. 3. Scrap gives 6 to 15 per cent., Scrap-crepe 4 per cent.

No. 4. Bark-scrap in the form of crepe, 4 to 8 per cent. Wild Pará loss on washing given by Dr. W. Esch in "Fabrication de Caoutchouc."

	Maximum.	Average.	Minimum.
Pará Bolivia and Peru ...	16	14	12
,, Amazon Hard Cure...	17	15	13
,, Island Soft Cure ...	20	18	15
Nanaos No. 1 ...	28	26	23
Entrefin ...	25	22	18
Sernamby : Niggerhead ...	40	30	26

(Here we see that with the exception of Clot, giving a loss of 30 per cent., even the scrap in cleaner than the best wild Pará. Clot giving anything like this loss must be very unusual and is a disgrace to any estate).

I have shown elsewhere sufficiently clearly, he says, that in *Hevea brasiliensis* caoutchouc and the substances which combine to form it play a direct alimentary part, so that every system of too strong or insufficient milking only induces a loss of Caoutchouc. If the tapping has a direct action on the amount obtained, can it not equally affect the quality of the rubber? We do not know in what form the rubber occurs in the laticiferous vessel, but we know it is not in the same state as it is in the latex when it exudes from the cut.

If we heat Hevea latex in some vessel, we obtain a clot. If we heat a living branch of a tree, we can see that when afterwards we break the best bark the laticiferous tubes do not contain threads of rubber, though this occurs under the same circumstances in the stalks of rubber producing *Apocynaceae.* The different substances which combine in the formation of Caoutchouc in the latex of Hevea cannot be produced with equal rapidity, it follows then that the methods of tapping of different intensities may exercise direct and variable influences on the value of the Caoutchouc.

It appears that during the past few years the difference in value between the washed wild Pará washed Plantation rubber has increased from 1 franc to 1·50 per kilo on 1906, to 2·91 and 7 francs a kilo in about a year.

It has been suggested that this diminution in value has been caused by the great over-tapping due to the demand for rubber on account of the high price it reached during the past few years. Other people attribute it to the age of the trees tapped, and those who incline to this opinion seem to have chiefly studied the amount of resins soluble in Acetone which may make the difference in value.

H. Wright in his "Hevea brasiliensis" p. 205, says the resins or oils vary from 1 to 4 per cent. according to the age of the trees.

M. Kelway Bamber, in the report of the Committee of Agricultural Experiments in Ceylon, gives :—

	2 years.	4	6	8	10-12	30
Moisture ...	·70	·65	·55	·85	·20	·50
Ash ...	·50	·30	·40	·14	·22	·25
Resin soluble in acetones ...	3·60	2·72	2·75	2·66	2·22	2·32
Proteins ...	4·06	1·75	1·51	1·75	2·97	3·69
Rubber ...	91·20	94·58	94·79	94·60	94·35	93·24

In other rubbers something of the same kind has been shown. C. O. Weber showed that in Castilloa passing upward from the trunk to the leaves the amount of resin in the latex rose gradually from 2·61 to 7·50 per cent. And M. Vernet has shown that the younger the branches of Ficus clastica are, the more sticky is the rubber, and that in *Landolphia* and other *Apocynaceæ* the young parts of the plant give only a sticky substance, while the adult parts of the same part give a latex containing a strong rubber.

Many planters whom M. Vernet has consulted affirmed that they never found that the age of the trees made any difference to the same price of the rubber on the market, but this is no criterion, as prices were given for appearance as much as for real commercial value. Caoutchouc from trees of various ages were sent from the Botanic Gardens, Singapore, to America and England for analysis, and the verdict was that there was no difference. M. Vernet sent to the firm of Michelin, in France, latex from trees of different ages in the Botanic Gardens of Singapore, and the result of analysis he gives as below :—

	5 years.	10 years.	20—30 years.
Ash ...	0·03 per cent.	2 per cent.	·25 per cent.
Resin from the dry rubber ...	1·47 ,,	1·44 ,,	1·47 ,,

The resistance to heat at 80° all well preserved, the 5 year old trees rather better then the others. Messrs. Michelin consider that there is practically no difference between these samples. However, they were not large enough for exhaustive experiments.

A third suggestion has been that the differences in soil and climate between South America and Tropical Asia is the cause of the difference between the two rubbers. M. Petit (Encyclopedie Roret Caoutchouc et Gutta Percha) compares the position of linseed, as produced in Russia, India and the Argentine, the oil of which has different properties and qualities in these different countries, and suggests a parallel in rubbers.

M. Gerber states that the rubbers of different regions of Amazonas have different values and puts it thus: there are "crus de caoutchouc comme il y a des crus de vin" (*i.e.*,—there are vintages of rubber as there are vintages of wine). However, he says it is possible and probable that these differences are due to various causes, local methods of preparation, skill and care on the part of the operator, etc. Besides, the balls of rubber are marked with the name of the maker and those that bear certain marks are the ones most valued and sought for. May not, says M. Vernet, each tree produce rubber possessing its own individual properties? This occurs in other trees and probably also in Pará Rubber.

Another suggestion not made by M. Vernet, but which he will doubtless refer to in the continuation of the series of articles is that the rubber tree that we cultivate in Asia is a different strain or variety from that now supplying the bulk of the Amazonas rubber.

Practically all the Asiatic trees sprung from one lot of seed collected at Tapajos, but nowadays the bulk of the South American rubber comes from a much more remote district and it is certainly probable that the tree would vary in different districts and its produce would equally vary. Specimens of the plants from the areas at present worked have been received at Kew and they appear identical. It does not follow, however, from this that the rubber would be identical. An expert in rubber from Brazil visiting the Botanic Gardens at once identified the tree and rubber as what was formerly known as Tapajos, or low river rubber, and stated that it was not considered as good as Bolivian.

With respect to the analysis showing that rubber from young trees is not richer in resins than that from old trees, and to the statements sometimes made that for commercial purposes young is as good as old, if the preparation is equally good, one would receive this with caution in view of the great difference in strength and pull of the two. Evidently much more chemical research is wanted in the matter.—*Agricultural Bulletin of the Straits and Federated Malay States.*

"Castilloa" Culture in Java.

Seven years ago there were on the various plantations in Java 119,285 *Castilloa* trees, while at the same time there were only 24,023 *Hevea* trees. Since that time, however, the planting of *Hevea* has increased with great rapidity until at the close of 1910 the *Hevea* trees in Java numbered 1,395,999. The planting of *Castilloa* on the contrary has shown a number of fluctuations, some years increasing and some decreasing, while the number of trees planted last year was only 24,872 and the total number of *Castilloa* trees in Java at the close of 1910 was 388,862, or not much more than one-third of the *Hevea* trees.

Notwithstanding the obviously greater popularity of the *Hevea*, owing to its lower percentage of resin and its greater yield under favourable conditions, the *Castilloa* has some advantages which the Java planters have come to recognise; namely, it can be grown at an altitude where the *Hevea* will not flourish, and it is more suited for planting in conjunction with other growths, as it is practically self-pruning. While the *Castilloa* tree can be grown successfully at an altitude that would be

distinctly unfavourable to the growth of the *Hevea* it does better and comes to a yielding condition earlier when planted at a lower attitude.

In the general report for 1910 prepared by the Netherlands East India Committee there is a very interesting paper by Mr. Fr. Gierlings, who has had an extensive experience in the planting of *Castilloa* at Kediri, in Southern Java. He finds that the culture of *Castilloa* is easy where one has perfectly fresh seed, seed older than three weeks giving but unsatisfactory results. He has noticed that in wet years the *Castilloa* in Java blossoms twice in a year, the first seed, which ripens in August or September, giving but poor returns for planting. The second seed, which becomes ripe in December or January, gives much more satisfactory results. He and neighbouring planters have tried many experiments in *Castilloa* planting and have finally adopted the plan of making their plantings 12 feet apart in an easterly and westerly direction and 24 feet apart from North to South in closely grown coffee gardens. In this way they get about 100 trees to the acre. For the first two years the trees apart from the coffee trees grow more rapidly but after the *Castilloa* among the coffee trees has risen above the coffee its growth is more rapid than that of the trees in the open.

While there are many complaints in other places in regard to diseases and insect ravages the *Castilloa* of Java appears to be practically free from these pests and even where the bark has rotted because of careless tapping and considerable surface of wood is exposed, the trees still appear to be fairly immune from insects.

Mr. Gierlings has devoted a great deal of time to experiments in tapping. His latest method, tried last year, has given the best results and it is well worthy of a brief description. His method is as follows :—

With a knife like that shown in the illustration, and which is made by the native blacksmiths, horizontal incisions are made beginning about one foot from the ground and going around one-quarter of the circumference of the tree. These incisions are made about three inches apart, being cut half an inch deep, or down to the cambium, and are continued until there are 50 of them, reaching to the height of 13 feet. The same operation is repeated on the next quarter of the tree, beginning at the top and working down, but a narrow strip of bark about one inch in width is left between these two series of horizontal cuts. . . .

After a rest of three months the other half of the tree is tapped in the same way and three months later the operation is repeated on the first half of the tree, the incision, however, being made about half an inch below the original cuts. As the tree is allowed to lie idle during the three months' flowering season, it is tapped only three times a year. This method of tapping produces about eight ounces of dry rubber a year from trees eight to nine years old.

The latex exuding from these incisions is in the form of a soft mass. With every tapper is a woman, whose duty it is to collect the latex. Her equipment consists of a large bamboo pot, a small bamboo pot, a spoon and some bamboo spatules. The large pot is equipped with a sharp point at the bottom so that it can be stuck into the ground. Both this and the small bamboo pot, which she carries with her, are partly filled with water. She mounts a ladder to the uppermost incision and works her way down the tree scraping the latex with the bamboo spatule into the spoon and pouring it into the small pot, which when full is emptied into the larger one. The contents of the larger pots are collected by men and carried to the factory, where the latex is passed through a coarse sieve and then diluted with water, and passed through a finer sieve into a washing vat, usually made of gal-

vanized iron and holding from 25 to 75 gallons. After the liquid has settled the rubber globules come to the surface and the remainder of the liquid is drained off through an outlet at the bottom. Fresh water is then poured into the vat, the mixture stirred and allowed to settle, and again drained off.

This is repeated until the latex looks pure, which generally requires three or four washings. The washing of the latex is usually completed the day it is gathered.

The latex is then coagulated in round enamelled pans. About a pint of latex is poured into each pan together with one-third of an ounce of a 40 per cent. solution of formalin, the two being well stirred together. In the meantime, a boiler of water has been heated containing about one gram of 98 per cent. acetic acid per quart of water, when the water is close to the boiling point three-quarters of a quart is poured into each pan of the latex. In this way the latex is heated to from 150 degrees to 160 degrees Fahr. and immediately coagulates and floats on the top of the water in spongy cakes. These cakes are pressed together and the water poured out, but is saved and the latex it contains secured later. The coagulated cakes are immediately rolled into thin sheets. Those are placed again in vats with clean water to which a very little formalin has been added and allowed to remain there for a few hours and then removed to the smoking and drying house, a building with perforated iron floor, on which drying racks are placed.

The Temperature in the smoking house is kept at about 110 degrees Fahr. and a dense smoke is developed by means of burning damp gas. The sheets of rubber remain in this smoke house for two or three days and get about one-half dry. They are then pressed into small squares weighing about 3½ pounds. These are placed in another formalin solution for a shorter time and then taken again to the smoking house for a final drying. The rubber is allowed to retain about 5 per cent. of water when it is shipped, experience showing that it dries out on the way and that it keeps much better. The square blocks are packed in smooth finished cases made expressly for them.

Regarding the cost price of rubber nothing absolutely definite, in Mr. Gierling's opinion, can be said, as so much depends upon wages and weather. He found that 1909 with a small yield per tree but with generally favourable weather and low tapping expenses his rubber cost him when put on board the steamer at Sourabaya about 16 cents. per pound. The following year, with a larger yield per tree but with very unfavourable weather and higher wages for tapping, his rubber cost him 23 cents per pound, averaging about 20 cents. a pound for the two years.

The Coagulation of Ficus Elastica Latex.

The *Journal d'Agriculture Tropicale* for April 1911 contains details concerning a new method of producing the somewhat difficult coagulation of the latex of *Ficus elastica*. This has been evolved in Java, where the latex is usually coagulated mechanically, by beating with a wooden spatula. This process requires a long time and a great deal of labour. The new principle is to 'encourage' coagulation by the addition of a coagulum obtained in the following way. On each day about a pint of the thickest latex is taken, and coagulation started by stirring (not heating) it with a wooden spatula. When this has arrived at its proper stage it is added to the ordinary, thinner latex, when the rubber separates out in about a quarter of an hour, instead of the hours that are required by the method in which beating is employed. It is on account of this action that the added coagulant is said to 'encourage' (amorcer) the coagulation.

The Planters' Chronicle.

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(INCORPORATED.)

The Scientific Officer.

Mr. Anstead arrived back on Wednesday night—two or three days earlier than was expected.

Coffea Robusta Seed.

It is to be feared that the small orders received cannot be executed this season. Java correspondents write:—" It is now rather difficult to obtain the required quantity of Coffee-seed, as Coffee-picking is now almost finished . . . . We will, however, take further steps in the matter and advise you in due course of the results."

Demand for the seed in Java and in various other countries has been active, and South India has been by no means alone in experiencing difficulty in procuring supplies.

Book of Proceedings, 1911.

All proofs have been revised and sent in to the printers, so that the book ought to be published within two or three days. The price of this year's volume will be Rs.2 per copy, per V. P. P. (postage included).

New York Rubber Exposition, 1911.

In the Correspondence section Mr. A. Staines Manders, the Organising Manager of the above Exhibition (and formerly Organising Manager of the International Rubber and Allied Trades Exhibition held at Olympia this year) draws attention to the proposed Rubber Exposition at New York next year. Details will no doubt be forthcoming later. In the meantime planters in South India, and the various District Planters' Associations, will have an opportunity to consider whether they should be represented or not. By the time the next Annual Meeting of the U. P. A. S. I. is held it will be too late to take this question up. If, in fact, anything is to be done, arrangements must be made at an early date.

Scientific Investigation in Tonquin.

It is worthy of note that at the request of the Department of Agriculture and Commerce in Tonquin the Resident Superior has made a preliminary grant of 1,000 piastres so that officers of the department may commence studies and investigations to enable them to decide what measures should be adopted for an effective fight against the insect and other enemies of the coffee plant in that part of the world.

The above fact is mentioned by the *Bulletin de la Chambre d'Agriculture du Tonkin et du Nord-Annam*, which also discusses the same subject and that of the war against insects in such a manner as to show that these matters are being taken in hand with no little vigour.

SECRETARY'S PAPERS.

IV.—Valorization, Tea, and Coffee.

In the present issue a " selected cutting " is given wherein a well-known Philadelphia merchant, a large dealer in Tea, gives his opinion as to the comparative cost of a cup of tea and a cup of coffee, and comments on the prospects of the tea market. What he writes seems to indicate that, if tea is vigorously pushed in the United States during the near future there is likely to be a large expansion of demand. In a country with such a huge population this would mean a great increase of consumption, which would materially strengthen prices in all countries where tea is consumed.

In the "Coffee" section of this number „ extracts are given from a circular issued a few weeks ago by Messrs. NOrtz & Co., of Havre, a firm of high repute in the Coffee trade. Particular attention is drawn to the large extensions that are being made in the area under coffee, notwithstanding the law that forbids them. The Government that conceived the Coffee Valorization plan, and subsequently deviated very considerably from the originally declared lines of that scheme, is said to wink at evasion of its own law forbidding the planting of coffee in new areas. It would appear as if that Government were confident of carrying its Valorization project to a successful issue before these new coffee areas come into bearing and help to increase supplies of a product that already bids fair to have to face a shrinkage of demand, as the outcome of an artificially manipulated high level of prices.

In connection with the two papers referred to above—which should interest both tea and coffee producers—attention is drawn to a circular issued towards the end of October by Messrs. Miller & Co., members of the New York Stock and Coffee Exchanges. This circular is described as a " Review, a Criticism and a Forecast." The following are extracts from its contents :—

" The continuous advance in coffee options in the markets of the world is attracting a large degree of public attention and certainly a large amount of discussion in the trade.

" We are not spot dealers, importers nor roasters, but engaged only in the purchase and sale of coffee options for clients as an incident of our business, which includes membership in the New York Coffee Exchange. Thus our views are unprejudiced and absolutely uncoloured by any personal interest, and obviously it is a matter of no concern to us in what way coffee may fluctuate.

" By analyzing the statistics of production and consumption for the crop seasons from 1887 to 1896, the conclusion is reached that a comparison of average deliveries to the average crop, and, the relatively small average visible supply each crop year, furnishes satisfactory reasons for the high average price for the options during this period.

" Summarized, the ten years show for the period 1886—1896 : An average price of 14·40 for options ; an average crop of 10,102,000 bags ; an average of deliveries of 10.604,000 bags ; an average ' visible ' at the beginning of each crop year of 32·6 per cent. of the succeeding year's crop.

Taking a fifteen-year period from 1896 to 1911, the review says :—

" We can pass from the period above mentioned and observe the figures from 1896 to July 1911. Here we reach a fifteen-year period of low prices, which may be indicated by a high of 11·86 in July, 1896, and 11·84 in January,

1911, and a low of 3·55 in June and August, 1903; such crop out-turns as nearly 24 millions in 1906-7 and deliveries of nearly $18\frac{3}{4}$ millions in 1908-9.

"During this fifteen-year period the figures show an average price of 6·67 for options, an average crop of 16,231,000 bags, an average of deliveries 15,963,000 bags, an average visible at the beginning of each year crop of $59\frac{1}{2}$ per cent. of the succeeding year's crop and a visible October 1, 1911, against the current crop of, say, $15\frac{3}{4}$ millions, of 78 per cent. thereof.

"It is obvious the fundamental situation above disclosed warranted a lower range of prices than during the first period covered.

"Now touching on this matter of the visible supply and of the 5,000,000 bags of valorization coffee, which is tied up, and is a part of the visible, at first blush, one would figure the valorization visible as unavailable—not to be counted, and thus a factor of bullish import. But is it? We think not. We are inclined to believe it should be considered as operating bearishly, in that it must be sold annually in amounts to the extent of several hundred thousand bags at certain dates. Were this part of the visible in private hands, it would be carried along and worked off as crop situations permitted. Valorization was arranged for in the year 1908, when 7 million bags were purchased by the committee, which, of course, was still counted as part of the visible. This 'unavailable' part of the visible did not help the market, for prices showed no improvement between the year 1908 and fall of 1910. The valorization proposition involved a colossal Government gamble, wherein it was hoped that by various taxes and restrictions the Brazil crop would be reduced to small proportions, while the world's consumption increased, and yet the small Brazil crop of $10\frac{1}{4}$ millions of the 1907-8 year was followed by one nearly $12\frac{1}{2}$ the next year and practically 15 millions the following year, with a fortunate reduction to $10\frac{1}{2}$millions in 1910-11.

"We regard the valorization visible as a proposition by itself of deterrent influence on the market, broadly considered, and not in any way an aid to the promotion of higher prices.

"In this connection we would observe it is strange that on a matter so vital to the coffee trade of this country, no steps have here been taken to develop a system of reporting on Brazilian crop conditions somewhat in the way of our own crops. We have initiated correspondence with the Department at Washington to see if something can be done in this respect and our correspondence has already aroused interest there. It is well within the possibilities that in the next few months plans may be consummated whereby the coffee trade here will be receiving reliable and official information at regular intervals on this important affair.

"And if it be really true that the 1912-13 crop is in so perilous a condition, why is it that the September, 1912, option is selling at a discount of 125 points below the current month? That has not been the way other commodity markets—wheat, corn, oats, cotton, etc.,—have settled their current belief in a small coming crop.

"Further, precedent affords the belief that current talk of disaster may be unduly enlarged."

The conclusion is:—

"Our judgment is that the recent high level has fairly well discounted conditions both as relating to the size of the present incoming crop and such of the news regarding the new crop as may be entirely veracious, leaving the future to care for itself in the way of definite developments either favourable, unfavourable or negative. . . . . . If our analysis of the situation be correct the entire collection of facts at our disposal and a reasonable discern-

ment of those later to develop, which will make the present artificial and manipulated situation untenable, leads us at this time to avoid the suggestion of participation on the bull side, and to look for a return finally to a more normal price."

Unqestionably, Valorization stocks hang over the world's markets in a threatening way; but for the present they are so held as to give strength to prices, and this has meant weakness in consumption. Ultimately, no doubt, prices must fall, unless crops fail to a very large extent; and when they do fall the chances of recovery will be anything but hopeful if, in the meantime, a larger consumption of Tea and of "coffee substitutes" has been stimulated because of the artificial holding up of coffee prices that is now being effected. With a Government interested in immense stocks of coffee, trying to help in the maintenance of high prices until that stock shall have been sold out; with the same Government permitting, at the same time, extensions of cultivating area that will mean in future years an increase of supplies; with a steady decrease in consumption induced by current high prices; the eventual prospect is one of a great excess of supply over demand and a consequent low level of prices.

True, prices of tea have risen, as well as those of coffee; but the consumer does not feel the burden so much in the former case, a rise of 1*d.* per lb. in tea being, so to say, distributed over 250 cups, a similar rise in coffee over only 75 cups. [These figures are taken from one of the Selected Cuttings mentioned above, and are perhaps not strictly applicable to the experience of the small consumer. Still, there can be no doubt that, whether used by a restaurant-keeper or a householder, a pound of tea means many more "cups" than a pound of coffee does]. Besides this, the cost of Tea may rise and that of Coffee fall, both to a very considerable extent, and yet a cup of tea will cost much less than a cup of coffee. As between these two rivals, therefore, present conditions favour the former, and future conditions seem likely to do the same for a long time to come. As regards the "coffee substitutes" the popularity into which they are being forced by generous advertisement and active enterprise cannot be said to be at the mercy of a fall in coffee prices; for the makers of these substitutes can face with equanimity a drop of 50% or more, and yet see their way to splendid profits.

It must be acknowledged that, by forcing prices up, this Brazilian Valorization scheme has put money in the pockets of producers in Southern India. But in so far as it has forced rates up to a higher level than is agreeable to consumers, it has become a menace to this same producer in the future. While, therefore, he rejoices over the present he can scarcely fail to be doubtful about what is before him. It is noteworthy also how the old-time difference between prices of Brazil Coffee and prices of so-called "mild" descriptions has shrunk. This is another ominous sign for the producer out here. That he will "come out all right" is to be hoped; but it is evident that *natural* forces appear likely to move towards lower prices within the next few years though *artificial* forces are being so engineered as to produce a temporary rise—a rise that is far from being wholly a cause for rejoicing, because of its tendency to counteract an expansion of consumption.

As Messrs. Nörtz & Co., of Havre, stated in a recent circular:—"The natural evolution of things will tend toward another overproduction in the future," all the more so because all the other coffee-growing countries besides Brazil will try to increase their own output. "It is also certain that the crisis, when it comes, will probably be rapid, since the present high range of values cannot fail to have its influence on the world's consumption, and the consuming markets having gradually become weakened, will not be able to offer any resistance."

CORRESPONDENCE.

The Cancer Scourge.

Sir,—I am herewith sending you a copy of the Cancer Scourge by Robert Bell, M.D.F.R.F.P.S. &c, published by the *Order of the Golden Age*, London, in which the author has proved the connection between *Flesh Eating and the Diseases.*

I request you to kindly review the book in your columns in the interest of human health, and favour me with a copy of it if you please.

LALUBHAI GULABCHAND JAVERI,
Bombay, 19th Nov. 1911. *Hon. Vyavasthapak,*
Shri Jiv Daya Gnan Prasarak Fund.

[The Book is not one that could be properly recommended as an indispensable volume for "The Planter's Library," so no review of it will be published in this paper.—ED., *P.C.*]

Periyar Sample to Rubber Exhibition.

Dear Sir,—I noticed some time back Mr. Kirk's statement that he had sent a sample to the Rubber Exhibition but I did not answer it at the time. I notice in your issue of the 7th October another reference to the subject in which Mr. Kirk says that the sample was sent to Mr. Staines Manders for the *India Rubber Journal* Competition, and no doubt it was entered for this, but it was a pity after the Periyar Company subscribed to the scheme that they did not send it through the proper channel, as a sample could have been retained for exhibition in the South Indian Court. As it was, Periyar Company was not exhibited to anyone's knowledge, as of course samples for the various competitions were shown under a private mark and as I have already stated the fact that Periyar was not represented amongst the exhibits was much commented on.

Trusting you will publish this in your next issue.

31st October, 1911. (Sd.) J. A. RICHARDSON.

Delegate for Southern India to the International Rubber Exhibition.

Nitrate of Potash or Refined Saltpetre.

Dear Sir,—Messrs. Stanes & Co., Ltd., give some very interesting figures under the above heading in your issue of November the 18th but, without any disrespect to them, we think they will agree with us that figures can generally be made to prove anything. Obviously if a non-nitrogenous potassic manure is to be taken for comparison with Nitrate of Potash, it is only fair to take Muriate of Potash: like Nitrate of Potash, Muriate of Potash contains common salt and for this reason is not generally considered a desirable fertiliser for soils deficient in lime like those of Southern India, and doubtless this objection weighs with Planters among whom it would appear from Messrs. Stanes & Co.'s letter that Nitrate of Potash also is not very popular.

Muriate of Potash contains 52% Potash and costs Rs.170 per ton and so the unit value of Potash may be taken as Rs.3-4-4 for purposes of comparison. At this rate 35% Potash in Saltpetre is worth approximately Rs.114-8-0 leaving a balance of Rs.105-8-0 (going on Messrs. Stanes & Co.'s figures) for the Nitrogen. Taking the Nitrogen in the Nitrate of Potash at 9% this brings the unit value up to Rs.11-12-0.

We cannot agree with Messrs. Stanes & Co., Ltd., that it is generally

admitted that the Potash in Saltpetre is of higher value than the Potash contained in the various products of Stassfurt Salts.

for PEIRCE, LESLIE & CO., LTD.,
(Signed) W. CHRISTIE,
Director,
AGENTS, POTASH SYNDICATE.

Calicut, Nov. 20, 1911,

A Rubber Exhibition in New York.

You will see by the above heading that an International Rubber Exhibition is to be held in New York in September of 1912; I have just returned from a visit to that country.

The Exposition will be a very important one and already the promises of support have been wonderful; it is a chance that plantation rubber will not get again for some years. The door of the United States is at the present time, open for plantation rubber; manufacturers are beginning to seriously consider the value of it compared with the supply they now get from Brazil which they have been using almost exclusively. It is now left to the planters to show the quality of the various grades and they can get the trade; the trade; the manufacturers must also be assured of the supply in the near future. They are resenting so much the tactics of the Brazilian people, and in view of the increased production in a few years, the Planters should certainly get a good footing in America where half the supply of crude rubber is used, and where half the rubber goods are manufactured.

I know the questlon may be raised that this Exposition is coming only fifteen months after the close of the London one: true, but no other date could be arranged unless June of 1913 but it would be out of the question to hold an Exposition in New York in the middle of an American summer as all Manufacturers would be away, or if not, they could not visit New York. Again, it was considered that the time was ripe for such an Exposition.

It therefore behoves your country, as well as others, to come forward and show their products. I have written on the subject to Mr. J. A. Richardson, who has kindly consented to join the Honorary Advisory Committee of the European Section of which Sir Henry A. Blake, G.C.M.G. is the President. . . .

I should not have taken up this Exposition had I not thought it would be an excellent opportunity for the Planters.

I shall be glad if you will kindly make the Exhibition known; printed matter will follow in due course.

(Signed) A. STAINES MANDERS,
Organising Manager.

London, 10th Nov. 1911.

The U. P. A. S. I. Exhibition.

Dear Sir,—I have been anxiously awaiting to see the reply from Messrs. Hamilton to "Ignoramus'" letter in your issue of the 14th October *re.* "Arabian-Bussanhulli" exhibited by the above mentioned gentlemen at the recent U. P. A. S. I. Exhibition. I, like "Ignoramus," have been a planter for over a quarter of a century and have never stumbled across this new and interesting variety! Does silence on the part of these well known and prolific exhibitors mean that they endorse "Ignoramus" letter, if so, what was their idea in introducing and exhibiting this very useless and apparently unknown species? If on the other hand, it was their philanthropic intention to prevent others of us trom planting this unremunerative and worthless seed, I for one would like to tender them my most sincere thanks.

NE SUTOR ULTRA CREPIDAM.

INSECTICIDES.

Kerosine Emulsion.

Kerosine emulsion is one of the oldest and at the same time one of the best insecticides. Another point in its favour is that the ingredients of which it consists are always to be found on every estate and as a matter of fact in every household. A few precautions are necessary in preparing and applying it, otherwise it will do the plants more harm than good.

The first thing to do is to prepare a good stock emulsion, which means that the oil and the soap water must be churned or swizzled in such a manner that they form a uniform mass looking like whipped cream. There should be no oil floating on the top of the mixture. Another matter of importance is that the mixture should be applied with a spray pump, the finer the nozzle the more effective the solution. In applying the mixture to plants, it must be remembered that it is not the whole plant that is to be sprayed but the insects on it, and in applying it should be the aim to spray only the insects as far as possible. The spray should not be put on in such quantity that it will drip off the leaves or run down the trunks of the trees; all that is required is that the affected parts of the tree be moistened with the fine mist issuing from the nozzle. If too much solution gets into the roots of the trees or shrubs it may cause some damage. The best time of the day to do spraying is early in the morning or late in the afternoon or on a covered day. Avoid the hot sunny part of the day.

Preparation of the Emulsion and Diluting for use.

Stock Solution :—

Kerosine	...	...	... 2 gallons.
Water	...	...	... 1 gallon.
Soap	...	...	... ½ pound.

Shave the soap fine into the water. Put on fire, an empty kerosine tin does very well, and heat until the soap is dissolved. Remove from fire and add kerosine while soap water is hot; churn with a pump or garden syringe by pumping back into tin or bucket through nozzle of pump or swizzle thoroughly until a thick white cream is formed, this will take about 5-10 minutes. Use rain water when possible. For use dilute with water as follows:—To each one gallon of stock emulsion

add	11 and ⅓	gallons	water	to get	5	per cent.	oil	emulsion.
,,	5 and ⅔	,,	,,	,,	10	,,	,,	,,
,,	3 and ½	,,	,,	,,	15	,,	,,	,,
,,	2 and ⅓	,,	,,	,,	20	,,	,,	,,
,,	1 and ⅔	,,	,,	,,	25	,,	,,	,,

Agitate the mixture well before applying.

Insects for which to use Kerosine Emulsion.

Kerosine emulsion kills all insects with which it comes into contact it is therefore useful for such insects which take their food by sucking the juices of the plants. It may also be useful, for tree inhabiting ants. It is impossible to give a full list of the insects, but some ot the following may serve as a guide :—

Ants living on trunks of trees and building nests on them. Spray small and soft bodied species with 10 per cent. solution; if ants are large and have hard bodies increase oil to 20 per cent.

Mealy bugs on cacao pods, 5 per cent.

Pod hoppers on stems of cacao, 10 per cent.

Scale insects on stems and leaves of cacao, 10 per cent.

Thrips on cacao, 5 per cent. and weaker.
White Orthezia bugs on Crotons, 10 per cent.
Scales on ornamental palms, 5 per cent.
Scales on citrus trees, 5 per cent.
Scale insects and ants on coconut palms, 10 per cent.
Lace wing bugs on egg plants, 5 per cent.
Lace wing bugs on soursop trees, 5 per cent.
White fly on soursop trees, 5 per cent.

For all above it is well to repeat spray at intervals of three weeks to kill any insects that may have escaped the first spraying, or hatched from eggs that escaped destruction.

A Few Dont's to be Observed in Using Kerosine Emulsion.

Don't spray trees when they are putting out young leaves and shoots.
Don't spray in the hot sun.
Don't use emulsion when the oil is ffoating on top.
Don't let spray drip from trees.

—*Board of Agriculture, Trinidad.*

Valorisation Schemes.

Readers of the *Economist* will remember the history of the disastrous speculation on the part of the Sao Paulo Government which led to the coffee valorization scheme. With the prevailing high prices, due to a short crop, the coffee is being successfully unloaded, and attempts are even being made to valorise other Brazilian products. Our Rio correspondent, writing on October 3rd, says:—A short time ago desperate efforts were made to introduce a most extraordinary and speculative scheme for keeping up the price of sugar at the expense of the home consumer, but happily it fell through, owing to the prudent attitude adopted by the Pernambuco planters. Notwithstanding this failure, a Sugar Conference is at present being held in the city of Campos (State of Rio de Janeiro), and it is expected that strong efforts will there be made to revive the previous attempt. It is curious to note that this Conference takes place at a moment when sugar has "valorised" itself by the natural law of supply and demand, prices having advanced phenomenally during the past month owing to the unfavourable statistical position in Europe. Efforts are still being made to put rubber on a minimum price basis, and now comes news of a fourth scheme for the valorisation of cocoa in conjunction with Portugal and Ecuador. A meeting has been called in Bahia for the 9th inst. for the purpose of discussing the basis of the project, promoted by Portugal, to raise the price of cocoa. The promoters say it has decreased in value owing to the combination of exporters, and one clause of the project provides for the direct supply to consuming markets, so as to avoid the heavy costs incurred through exporters' and middlemen's handling. It is stated that the Banco da Lavoura of Bahia will be asked to finance the undertaking, but this will probably be found too great a risk for any single bank to undertake on account of the huge capital required, and the danger of keeping a large stock of cocoa, which deteriorates very easily through climatic changes. The production of Cocoa in Brazil is now of very large dimensions, having increased considerably in the last few years. . . .

Furthermore, cocoa cannot be kept in storage in Brazil for any length of time, and the issuing of warrants under such circumstances, as is actually proposed, would be an exceedingly risky business. To overcome this latter difficulty the promoters suggest that the Bahia cocoa could be stored in Lisbon free from any Government charge, and quite safe from deterioration for fully twelve months.—*Economist.*

COFFEE.

Brazil's Crop.

Messrs. Nörtz & Co., the well known coffee house of Havre, issued a circular under date of October 14, reporting on the present state of the coffee industry of Brazil, and founded on impressions brought back by M. Nörtz from his voyage to Brazil.

Since the report was written the circular says that cables from their agents in Brazil stated there has been a good flowering, but rains of the last few days falling on trees in full blossom had done a great deal of harm. The estimates for the present harvest were reduced to 9,000,000 bags, while 8,000,000 was given as the probable figure for the next one.

The correspondents insisted on the power of the bull clique in Santos and the frantic desire on the part of all who were in any way connected therewith to force prices up. "Of all the news we have received," says the circular, "this perhaps deserves most attention. The present fever out there must be left to subside of its own accord, and the only thing to do is take advantage of the possibilities that this situation may offer."

Dealing with Rio and Minas coffee first, the report says the estimate of the probable crop in the States of Rio and Minas varied between 2,500,000 and 3,000,000 to 3,500,000 bags. The crop was evidently late, due to bad weather. The big arrivals of "Sul de Minas" were not expected for a few weeks.

Coffee, M. Nörtz indicates, is no longer of such paramount importance to the State of Rio as it used to be. The last report of the Leopoldina Railway stated that coffee, hitherto the main source of its revenue, now only takes up about 33 per cent. of its receipts, instead of 49 per cent. as in 1909, cattle, grain and imports making up the 67 per cent. In recent years the output has always been practically the same, about 3,000,000 bags.

All interest therefore, the review says, is focussed on the crop of the State of San Paulo, which now represents more than half the world's consumption.

With regard to this Santos coffee the report continues:—

"No one who has paid periodical visits to the coffee plantations of San Paulo can help being struck by the changes and improvements that have been brought about under the influence of care and higher prices, and, however great our expectations may have been, they have been surpassed by the reality. Never, in fact, have the plantations looked so luxuriant and healthy, and everybody who happened to have seen them concurred in this. This fact is particularly striking immediately on arrival at Campinas, where the coffee zone begins.

"This sudden change, apart from the natural cause, the moderate production during the last few years, is due more than anything else to the good treatment and care that the good prices prevailing since last year have allowed the planters to give them.

"One planter has learned from another so that the coffee estates of San Paulo have to-day been brought to a degree of perfection never known before.

"If the outturn of the present crop proves to be disappointing as to quantity, it is principally because the planters, without wishing it to be generally known, were all expecting an exceptional result this year, and had in consequence overestimated their harvest. But, on the other hand, the

result of the decortication has certainly been bad this year, as much on account of the smallness of the actual bean as of the unusual number of empty berries. This is, of course, attributable to the big drouth of December to March, which prevented the development of the bean, and did most damage to the larger trees, which naturally need more nourishment than the younger ones.

"This year's total production for San Paulo is estimated by men who are in every way competent to judge, whose good faith is indisputable and who are not acquainted with one another, at 323,000,000 coffee trees to 23,640,000 arrobes of 15 kilos each, or, in round figures, 5,900,000 bags. So that, calculated on the basis of the total of about 650,000,000 trees in production, the final yield would seem to be much greater than is at present thought at Santos, and it would appear that, even setting aside a margin of 10 per cent. the crop may be nearer eleven than ten million bags.

"As a matter of fact, this year's crop is certainly three or four weeks later than in previous seasons. While we were in the interior we noticed that all the railway stations, as well as the neighbouring warehouses, were filled up with coffee, and some stations even refused to accept coffee for want of room. It is equally certain that a number of planters, encouraged by the favourable news from the coffee markets, keep back their production. We know of one planter who has, as yet, neither shipped nor sold a single bag, out of a crop of 30,000 arrobes, and there are many others who, instead of selling their harvest, buy futures in Santos. To conclude, prudence requires us for the present to reckon on a yield of ten to ten and one-half million bags for the present crop, this figure being subject to later modifications.

"The question then is simply to know whether the drouth at the beginning of the year has left the trees incapable of producing a good crop next year, or if their healthy state will permit of a good flowering taking place during October-November as has been the case several times before.

"Time and the facts will alone be able to answer this question. The planters and other competent people whom we consulted all agree that the unseasonable rains cannot possibly have done any good, and that the extent of the next crop will be mainly decided by the past drouth in the springtime.

"Everybody is agreed that, given good weather, the 1913-1914 crop may possibly be the biggest on record, but it is quite obvious that it is at present far too early to talk seriously of that contingency, or take it at all into consideration.

"The Santos market is nervous, being aware of the dangers of the position, and after having been 'bearish' right up to the beginning of September, everybody is now a 'bull,' trying to make up for previous losses. Any scepticism as to the advisability of the positions they had taken up, or of extreme views, seemed unwelcome altogether.

NEW PLANTATIONS.

"Although the law forbidding the establishment of new plantations has not yet been repealed, and there are many people in Brazil who think it is still applied, every planter we met told us that he is planting a certain number of new coffee trees this year, generally in a proportion of 10 or 20 per cent. or even more, to those he already possesses.

"As a matter of fact, for the last six months, a regular fever of planting new coffee trees has overspread the State of San Paulo, particularly since many Fazendeiros have discovered that certain privileged planters have

been quietly going on planting during the last year, and that they themselves had been playing the rôle of dupes.

"One firm in San Paulo alone is known to be at present planting 800,000 coffee trees in Bauru, while another has brought about 25,000 aigueiras of land with the same object in view. Nobody cares any more about the law forbidding coffee-planting, and the Government takes care to wink at it—the elections being imminent.

"It appears, however, that this law is contrary to the constitution, as well as the law limiting exports of coffee, and it is to be regretted that in the last budget of the Government of San Paulo there should have been an item of two contos of reis (about £128) representing all the fines received for the planting of new trees, while if the law had been seriously enforced the figure would more likely have been 40,000 contos of reis, or perhaps even twice that amount. All the planters whom we consulted, save perhaps those of the very old districts like Companias or Ribero-Preto, told us that they had plenty more free land and forest where they could still plant coffee.

"We estimate that this year there will be about fifty to a hundred million new coffee trees planted, and about a hundred million a year for the next three or four years.

"However, it must also be remembered that the majority of the older plantations are not capable of an extension of more than 40 or 50 per cent. of their present area, and that the remainder of the planting will have to be done in the new districts of the Sorocabana, Parna and in the north, so that the productive power of San Paulo is not by any means unlimited.

"One of the most important points in the question of the future of the State of San Paulo is the labour difficulty. At the present time nobody seems to know exactly how this is going to be solved on account of the large tracts of new plantations that are in course of cultivation.

"Five months ago the Spanish Government joined the other countries in forbidding organized emigration to Brazil, because, in spite of certain changes for the better that have been brought about in the existing state of affairs, the San Paulo Government seems unable to protect the colonist against certain serious abuses.

"It must be admitted, however, that through the large demand for labour, the workman is rapidly becoming the master of the situation. There is already serious talk of the formation of labour unions, and it is highly probable that the abuses, that have done more harm to Brazil than she realizes, will soon disappear.

THE LABOUR QUESTION.

"We should like to say a few words about the complete change that has taken place in Santos and Rio as regards business in general. We are assured that 60 to 75 per cent. of the planters of Ribeiro-Preto, about 40 to 50 per cent. of those in Jahu and 90 to 95 per cent. of the Sorocabana planters are now entirely free from debt.

"The planter who in the old days used to consign all his coffee to Santos, pay about 5 or 6 per cent. commission, including new bags, and 10 or 12 per cent. interest per annum on loans, is becoming the exception. There are plenty of coffee buyers and speculators in the interior, who often pay higher prices than Santos, so that the planter in far the majority of cases is now getting full value for his product.

"Besides this, he can easily obtain loans now at between 6 and 7 per cent. from the Banco do Custeio Agricol, which is backed by foreign banks.

RUBBER

A Mexican Plan for Tapping "Castilloa."

Mr. J. C. HARVEY writes to the *India Rubber World*: Some months ago I contributed to your journal a short article illustrating with a sketch what I believed to be an advance in the direction of tapping Castilloa with less excision of bark than is the general custom. I took occasion to say that the use of the chisel one and a half inch in width with a long burl was a modification of the Trinidad and Tobago system, but that my plan provided a permanent system of channels to convey the latex to a cup or other receptacle. I regretted to observe that the sketch was defective as published, inasmuch as the chisel cuts were not shown, though a careful reading of the text would perhaps have been sufficient. Since then another idea has presented itself and is shown in accompanying sketch.

This system contemplates operation on virgin trees, either wild or cultivated, such as have not already been scarred by any other plan, or no plan of tapping. To make the application of this method as clear as possible we will assume that a group of trees to be operated upon have a diameter of ten inches, or in round figures a circumference of thirty inches, and the height of the channels to be ten feet from base to upper end. A cord can then be attached to a little peg driven into the bark at ten feet from the ground, drawn tight and fastened to another peg at the base of the tree. The entire angle should not describe more than one-third of the circumference of the tree. This cord should have a marked line drawn along it on the bark; in other words the bark must be marked with some pigment or coloured chalk to serve as a guide for the tools, as extreme care should be exercised to have these channels correctly made. The excision need not exceed more than one-half of the thickness of the bark. Some difficulty may be experienced in the beginning with individual trees, the latex of which may not be sufficiently fluid to run freely down the channel, but not more than in any other system; rather less indeed, since the angle is but a few degrees of inclination from the perpendicular, while all other methods as far as I know involve transverse excisions at an angle approximating 45 degrees, over the lower edge of which the latex often falls.

The plan now under consideration provides for three of these nearly perpendicular channels to be made, not at once but at intervals of three or four months, perhaps longer, according to the vigour and size of the tree; the chisel incisions to be made in a series as shown in sketch. It will be seen that these incisions are in strictly perpendicular series and the incline of the long channel is sufficient to catch and guide the latex to the receptacle at the base.

In establishing the long channels I have said that the excision need not be made more than half the thickness of the bark. When such latex as may be secured is free from the channel, the knife or cutting point can then be run down the centre of the channel, lightly touching the cambium where a much increased flow will be had. By this will be understood that most V or U-shaped knives for tapping *Castilloa* have a fine penknife-like attachment to run down the centre of the excision made by the first operation.

After a proper lapse of time the chisel operation is then worked and no further excision of bark occurs. One great advantage of the slightly inclined long channel is that less proportion of bark is removed than with the strictly perpendicular channel with the lateral transverse contributing channels; moreover the growth of new bark is in almost uniform line with the

expansion of the tree trunk, and the transverse excrescences are done away with.

If we are to accept the evidence up to date as final, *viz*: that the phenomenon known as wound response, occuring in the tapping of *Hevea*, is wanting in *Castilloa*, it stands to reason that with the continuing excision of bark in Castilloa as now generally practised, a time must come when the tree will require a very long rest to restore the connection between the lacticiferous tubes. Physiologically the union should be made much quicker in the case of incision with the long bevelled chisel. This method is not offered as a final solution of the problem of tapping *Castilloa*, but I believe it is in the line of progress, and I trust my fellow planters will give it their consideration.

[The illustration referred to cannot be reproduced here. It may be briefly described as showing slightly sloping (instead of perpendicular) cuts, each cut inclining, when looked at from the bottom of the tree, towards the right as the line ascends. The tapping cuts, however, are one below the other in a practically perpendicular line, and in several series connecting with the downward line at various points].

A Method of Tapping the Ceara Rubber Tree.

The *Agricultural Journal of the Mozambique Company*, Vol. 1, p. 49, describes a mode of tapping the Ceará rubber tree (*Manihot Glaziovii*), which is know as the Lewa method, as follows:—

The tree is fit for tapping when the rough or papery outer bark has been removed. If this has not been recently done the surface may contain dirt conveyed up the tree by little ants, so it is therefore advisable for the tapper to carry a stiff scrubbing brush, for the purpose of cleaning the surface. The portion of the tree to be tapped is then painted over with a weak acid solution—acetic, citric, carbolic or fluoric acid. The juice of citrus fruits, such as limes, lemons or oranges, or seeds of the baobab tree soaked with water, will also serve the purpose; but clean solutions only should be employed, and absolute cleanliness practised throughout. In the portion to be tapped, almost point-like incisions should be made, and the latex oozes out and flows down, and coagulates in thin ribbons on the bark. These incisions should be made 4 inches apart, as each incision drains the latex from 1 inch to 2 inches in every direction from the wound. An ordinary pruning knife is suitable, but every care must be taken that the incisions do not reach the cambium layer: a very narrow chisel, or a flattened bradawl, will also serve the purpose; but it is better to use a knife with a guard, to prevent the incisions from being made too deep. If the latex does not coagulate quickly, the acid solution is not strong enough. In damp weather the acid will be required to be stronger than in cold weather. The requisite strength will soon be found from experience.

Formerly, when the system was first started in German East Africa the rubber was rolled off the tree into round balls. It followed, of course, that particles of bark and dirt became mixed with the rubber, and the product was consequently of poor quality. Latterly, however, this method has been improved upon, and instead of the rubber being rolled into a ball, it is now rolled off from the tree on to a small wooden roller in such a way as to form a sheet when cut from the roller lengthways. The latter method is a great advance on the method of collecting in the form of balls, as the tapper can from time to time dip the roller into a pail of water and wash off particles of bark and dirt, and subsequently put the sheet through a washer.

The tapper should be provided with a rough scrubbing brush, acid and a small hand whitewash brush, for applying the acid, a wooden roller, about 6 inches long by $2\frac{1}{2}$ inches in diameter, and a pail or calabash of clean water. In addition to the tapper it is advisable to have a second boy to follow him to collect the rubber, for if too many trees are tapped at a time the rubber from the first trees will not be so easy to roll oft. When rolling the ribbons off they should be distributed over the roller as evenly as possible. It is desirable that the sheets should not be too thick, so the rubber should be removed at intervals according to the thickness. The size of the sheets would vary, of course, according to the size of the roller used. It is desirable that the sheets should be of uniform thickness and size, so the rollers should be all the same size. The rubber should not be exposed to light more than is possible, so whenever the roller is not in use it should be kept in a pail of water, and the sheets that have been collected should also be kept in water and brought in from the plantation twice a day, after the morning and evening tapping.

It is stated that further experimentation is necssary before a definite opinion as to the merits of this method can be expressed.

Uniformity of Shipments, &c.

A representative of the *Times of Ceylon* obtained a short interview on November 13 with Dr. Stevens, Rubber Chemist, of the firm of Messrs. Clayton Beadle and Stevens, London. Dr. Stevens had come out with the object of inspecting various rubber plantations, and he said he would probably spend a month in the island before going on to the Straits. He explained that it was about two years since he had last been in the East and, consequently, he would have much to look into.

Speaking of the recent Rubber Exhibition he said the general opinion was that it was a great improvement on the previous one. Some of the exhibits were splendid and bore testimony to the excellent standard of production which had now been reached. He stated that there had been some complaints about the arrangements at the exhibition, but he was of opinion that no one in authority could be blamed for that. It was the fault of the people who failed to send in their papers in time.

Asked whether he could say to what extent shipments of rubber to London were lacking in uniformity, Dr. Stevens said he believed that the small estates were to blame for what defects existed. There were many estates just coming into bearing which had not sufficient rubber to supply direct to manufacturers and, consequently, the supply of several of these small estates was tapped in order to make up a shipment. The result was a mixing up of various grades of rubber, and he himself had examined such shipments and found them to be composed of pale, medium and dark crepe. As far as the big estates went he thought that the majority of them turned out rubber of absolutely the first quality.

Referring to Rubber prospects generally Dr. Stevens said that it appeared that the demand for rubber would increase correspondingly with the increase in output. Such had been the case in the past, and he saw no reason why it should not be so with the future. The price, of course, might affect the consumption to some extent, as it did during the time of the boom, when substitutes were found for some rubber articles. At the same time he thought there was nothing to be afraid of.

Dr. Stevens declined to express any forecast as to the future price of rubber, as he said no one could possibly say what will happen to the market.

SELECTED CUTTINGS.

Tea and Coffee.

Mr. Thos. Martindale, a Philadelphia Merchant, writes to the *Journal of Commerce and Commercial Bulletin*:—

The writer has been away hunting in the big woods of new Brunswick, Canada, and Maine for the past six weeks, but has been kept in touch with both the tea and the coffee market, as well as a tardy mail service would permit.

The rapid advances in teas have not surprised me, as for months and months I have been predicting a much higher range of values in all kinds of teas. As a matter of fact teas have been too low altogether for several years, with the exception of Indias and Ceylons. Neither the growers nor the jobbers can have made anything like a fair return upon their investments and quite a number of able, intelligent and progressive merchants have been forced out of business entirely by reason of the prevailing low prices and the slight profits obtained in the past. Their time was not only wasted, but their capital was impaired and in many cases financial ruin resulted.

There was bound to be a reaction and a new adjustment of values sooner or later and the present rebellion in China furnishes a tangible reason for believing that the beggerly low prices prevailing during the past few years will give place to a much higher range.

By way of illustration only, several large invoices of Congou teas are now afloat, guaranteed to pass the Government standard, bought at 8c. f. o. b. Shanghai, with freight equal to 1½c. a pound extra, or say 9½c. to 9¾c.

It should be remembered that before the tea is ready for picking and firing, the tea plants are to be carefully cultivated. because the fragrant withered leaves must show the effect of "the sunbeams of long summer days, and not only the gorgeous colours of sunrise but the glowing tints of sunset's skies." Careful weeding will be necessary, and likewise plenty of rain. Indeed, everything must be propitious to bring the plants to the proper condition of perfection before the leaves are plucked and fired.

Then comes the packing in leaden lined chests, covered and strapped with woven rattan or bamboo, and lastly the shipment from the plantation to the receiving or delivery point, and all for a meagre 8c. per pound, of which the Chinese grower may get but 5c. or 6c. net for his share.

Is it any wonder that the present revolution is running like fire in the stubble?

The Ceylonese or India planters receive perhaps twice as much on the average for their product of the tea fields as the Chinaman does because they have better methods, better financial arrangements and a more advanced governmental control. In addition to the fact that British grown teas are intrinsically better made, they are in fact more generally satisfactory to the consumer in every way.

If the revolution in China is finally successful, as I believe it will be, better days will be in store for the industrious but scrupulously honest Chinaman. There will surely be less graft and more solicitude for the welfare of the millions of workers. It will mean in the end a better average quality of Chinese grown teas at a very much better price, and the trade must be prepared for a new range of values.

Now let us contrast the economy of the use of tea as against the present prevailing prices for coffee. The consumer can, or should, easily buy a pound of really good tea for 50c., and out of this 16 ounces of tea the consumer gets an average of 240 cups of good, strong tea, or about 1-5 of a cent. per cup, whereas a pound of good coffee, costing say 30c., will only

produce about 75 cups, or very much more than double the price of tea. As between the virtues of the two beverages I have over and over again tested them under the best conditions that a man can have, namely in the pursuit of big game where the hardest sort of walking, say up to the high mountain elevations, or down to the lowly bogs is necessary, day after day, in all conditions of weather, rain or snow or excessively low or equally excessive high temperatures prevail.

Under this crucial test tea will sustain a man's vigour and keep his spirits up much easier than coffee without leaving any bad after effects such as sleeplessness and indigestion.

The rank and file of the working people of Great Britain, Russia, Poland, Sweden, Norway, Denmark and in our own far Northern sections as well as in those of Canada have found this fact out long ago. When the trapper is outfitting for the winter, next to his bacon, salt and flour always comes the pound or the two pounds of tea. Coffee indeed being not thought of at all.

The Hudson Bay Company in outfitting its trappers in the Far North load their dogs sleds up with a liberal supply of white fish, which does equally as well for the dogs as the trapper. If wild geese have been killed in plenty during the previous fall, a few of those for the trapper only are strapped on the sled; then comes some salt, a little bacon, flour, matches, a few candles and surely the pound of tea.

On my recent hunting trip of 38 days I took with me a cannister containing 12 ounces of the top line of a chop of "String" Foochow Oolongs. My guide and I used from it morning and night, and also at times when we came to our cabin for dinner. It was always good, always cheering, always nourishing, and that 12 ounces lasted us for the whole trip and a little left.

In England particularly the consumption of tea is always increasing. There when "riches take wings and reputation falls to pieces" tea is the final comforter. An English writer eloquently extols "tea as a soothing drink: the dissolvent of all unmannerly humors, the ally of all good grocers, the friend of the whole human race, the contemner of class, the comfort of the duchess and of the washerwoman, the faithful companion in all ranks of life of every waking and many half-waking hours." It is this homely impartiality of tea that makes the eulogist's task so easy.

The surplus stocks of teas that held the market down for some years back in Great Britain have now vanished—have been consumed and, there's nothing now in the United Kingdom to hear the market as formerly.

Whether the revolution in China will be successful or not conditions in all pursuits in that mighty empire must experience a radical change, and it will take "time, the great arbiter of all things," to harmonize them and set the machinery of trade and commerce running smoothly once more. In the meantime the man who sits down and waits for present values to shrink and go back to the former low levels will, like Rip Van Winkle, wake up some day and find that the world "indeed to move" and that he has been left high and dry on a rocky shore without tea and minus his profits from not being on the band wagon rather than behind it.

Rubber Working Concession in Colombia.

The "Diario Official" of 6th September contains a notice granting to Juan Franzius a ten years' concession for the working of various plantations close to the river Tua, which come under the jurisdiction of the Intendencia del Meta. Under the terms of the contract the concessionaire agrees to pay a tax of 7 per cent. on the gross output of rubber intended for exportation, all such operations to be carried out through the Customs House at Orocue.

The Planters' Chronicle.

RECOGNISED AS THE OFFICIAL ORGAN OF THE U. P. A. S. I., INCORPORATED.

VOL. VI. No. 49.] DECEMBER 9, 1911. [PRICE AS. 8.

THE U. P. A. S. I.

(INCORPORATED.)

New York Rubber Exposition, 1912.

This was wrongly referred to in last issue as to be held in 1911; the proper dates are given in the further details published in the Rubber Section to-day. Last week's remarks, in fact, referred to the right date, the heading alone was incorrect. To prevent misunderstandings, it may be stated that the details given on another page are intended solely as *news*. They have been furnished by the Organizing Manager, and their publication must not be regarded as carrying with it any recommendation that planters in Southern India should take part in the Exposition. About that, the decision rests with themselves.

Bound Volumes.

Now that the subscription rate to non-members of District Planters' Associations has been raised, the prices of the bound volumes of *The Planters' Chronicle* must also be higher. Members of D. P. A's affiliated to the U. P. A. S. I. may obtain the yearly and half-yearly volumes at the old rates (except Nos. III & IV, which are out of print), but other buyers will be charged as follows:—

Vol. I	...	...	...	Rs.10	per V. P. P.
,, II	...	...	...	,, 24	,,
,, V/1	...	...	...	,, 12	,,
,, V/2	...	...	...	,, 12	,,
,, VI/1	...	...	...	,, 12	,,
,, VI/2	...	...	...	,, 12	,,

and Rs.12 will be charged for each future half-yearly volume.

This new scale of rates has been fixed solely for the purpose of preventing planters who do not subscribe to any of the local Associations from obtaining at very low cost the information contained in this paper.

The S. I. P. B. F.

Receipts on behalf of this Fund have now been issued in its name, to replace those formerly sent out in the name of the U. P. A. S. I.

Planters are requested to note that for the purposes of this Fund the "year" is reckoned as from 1st July to 30th June. When subscriptions are paid to Honorary Secretaries of District Planters' Associations precise information should be given as to name, address, estate (if any) represented, and the year to which each payment relates.

The subscription rate is Rs.10 a year: payments of smaller sums will be entered as *donations*.

Notes and Comments by the Scientific Officer.

141. *Hevea Seed Poonac.*—In a letter published in the *India Rubber Journal* of 14th October, Messrs. Walter Graham & Co., of London, give the results they obtained from crushing some samples of Hevea Seed.

"Undecorticated seed. Oil yield about 20 per cent.

Analysis of cake:—

Moisture	11·52	per cent.
Oil	6·08	,,
Albuminoids	15·31	,,
Carbohydrates, etc.	31·97	,,
Indigestible Fibre	32·54	,,
Mineral matter	2·58	,,
	100·00	per cent.

Nitrogen 2·45.

"This cake is high in indigestible fibre and low in nitrogen and would, consequently, fetch a low price relatively to other oil cakes. The oil may claim to be classed among the drying oils, and we value it at £28 per ton.

"Decorticated seed. Oil yield about 30 per cent., but quality inferior to that pressed from undecorticated seed. On the other hand the cake is of much better quality and we believe very suitable for cattle feeding. We think the seeds will prove of considerable value to the rubber companies."

It is interesting to compare these results with similar analyses which have already appeared in the *Planters' Chronicle*, bearing in mind that the analysis given above is of Poonac from undecorticated seed, which of course makes the Nitrogen content low on account of the admixture of husk, which is non-nitrogenous, or practically so. (Vol. VI, pp. 122 and 170).

While on the subject I may call attention to the fact that in the *Progress Report of the Peradeniya Experiment Station* from 13th July to 17th September it is recorded that "a large quantity of seed (Hevea) has been gathered for the purpose of making oil; the cost is something under ½ a cent. a pound: the weight of 1,000 seeds was found to be 7 lbs."

142. *Cockchafers attacking Coffee.*—When touring in South Mysore last May I was shown some young Coffee supplies which had their roots eaten off by some insect in the ground. On digging out the pits in which these plants were growing some large grubs were found and also a few specimens of a Cockchafer Beetle were captured. This beetle has lately been identified at Pusa as closely related to *Lachnosterna impressa.* Very little work has been done on the life history and nomenclature of the Indian Cockchafers. Lefroy in his 'Indian Insect Life' says of the group (*Melolonthidae*). "This very large family includes the familiar cockchafers, moderately large thickset beetles, the head small, the prothorax large and rounded, the abdomen, with the elytra, hard round, and robust. The forelegs are commonly broadened and fitted for digging in the soil. The posterior legs are strong, often well spined. Wings are present and the beetles fly well. The larvae are fleshy soft grubs, the body wrinkled and curved in an arc; the head is large, the apical abdominal segment very much developed." The beetles and larvae taken in Mysore agree closely with these characters. The larvae live in the soil and feed on the roots of plants, in this case on Coffee roots. The larvae can move actively in the soil and when full grown they make a mud cell and are transformed into pupae in the soil. It is possible that Vaporite would prove a useful deterrent, but probably this is quite an abnormal and unusual pest of Coffee.

RUDOLPH D. ANSTEAD, *Planting Expert.*

THE PLANTER'S LIBRARY.

The Rubber Planter's Note Book.*

Of the making of books there is no end, and during the last few years a steady stream of books on the subject of Rubber has flowed from the press. The latest contribution which has reached this office is "The Rubber Planter's Note Book" by Frank Braham F. R. G. S., Crosby Lockwood and Son, London, 2/6. The author states in his preface that the object of the book is to "provide a note book which the rubber plantation assistant can take with him into the field for purposes of reference and guidance." The book is small in size and can easily be carried in the pocket and it fulfils its object very well. It contains only the briefest account, however, of the industry and is in the nature of notes more than anything else. To the beginner, and the young assistant straight out from home, it will no doubt prove useful, but for anyone with more than a few months' experience of rubber growing it contains little information.

It may be noted in passing that the author is an enthusiastic clean weeder and describes exactly how the pernicious system of scraping should be carried out. So far does his enthusiasm for this practice carry him that he boldly asserts that—"experience has fully proved that satisfactory growth can only be obtained by maintaining the estate in a perfectly clean condition." Green dressings and cover crops are not condemned, they are not even mentioned. It may be that this is because the author has not yet discovered Southern India in the course of his geographical studies, at any rate in his "notes on the geography and climate of Pará growing countries," to be found towards the end of the book, India is not mentioned, though the *Planters' Chronicle* has the honour of being quoted among the rubber Magazines and Journals.

The author also recommends thumbnail pruning, a system which has proved a failure in practice. The explanation of the phenomenon of 'wound response' is lightly dismissed as being "best explained by the fact that tapping irritates the tissues and in the neighbourhood of the incisions new latex vessels are formed."

There is a useful chapter on the various machines used in the preparation and manufacture of rubber on the estates, a brief note on Rubber seed oil, and the book closes with an interesting section of General Information. Twenty "essential rules" for the preservation of health are given, and of these Nos. 4 and 13 will commend themselves to rubber planters the world over. They read as follows:—

"Drink as little as possible: fluids inflate the bowels. It is better to avoid alcohol except under doctors' orders. Avoid strong coffee and tea. Never drink beer!"

The book can be commended to the attention of young assistants and will prove very useful to them during the first months of the new life on a Rubber estate. and it will serve as a guide to the many problems which should be studied from the bigger and fuller text books, a list of which is given by the author.

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*The Rubber Planter's Note-Book.—A Handy Book of Reference on Pará Rubber Planting, with Hints on the Maintenance of Health in the Tropics and other general information of utility to the Rubber Planter, specially designed for use in the field; compiled from the most reliable and modern sources by Frank Braham, F.R.G.S., with diagrams and photographs, *London*, Crosby Lockwood & Son, 7, Stationers' Hall Court, E.C., and 121a Victoria Street, S. W.

CORRESPONDENCE.

Shipments to the United States and Canada.

Dear Sir,—We shall be very much obliged if you will kindly bring to the notice of the Members of your Association interested in shipments to U. S. A. and Canada that a direct service with regular monthly sailings from Tuticorin to Boston and New York has been started by the American and Indian Line which as the only direct line from South India to America is not only the quickest but also the cheapest route.

The next sailing will be the s.s. "Pagenturm" on or about 25th instant. The duration of the journey is approximately 40 days,

We shall have great pleasure in furnishing you with freight quotations and any further information you may be desirous of upon application.

Per Pro VOLKART BROTHERS,

Tuticorin, 4 Dec. 1911. *Tuticorin Agency.*

....

AGENTS: AMERICAN & INDIAN LINE.

A Criticism.

Sir,—It is a well known fact that the advertisements and propaganda of tea planters are on a very large scale. They pay well for it and meet deserved success. But is it possible that they have "captured" the *Planters' Chronicle*? Part of page 740 and the whole of pp. 751 and 752 of the last Number, (December 2) is given up to the glorification of tea and (here's the rub) the deprecating of coffee in comparison. Coffee planters may not as a class have the business "push" of their brethren in tea but surely they have proved themselves staunch supporters of the *P. C.*, the U. P. A. S. I. and the scientific schemes connected therewith. It is scarcely fair that an organ, in which, nominally at least, they have a share, should lend itself to the tactics exposed in the pages above mentioned. The fact that the accuracy of the statements can be impugned does not affect the question whether these advertisements (for they are little else) should be inserted in the ordinary pages of the *Chronicle.*

Yours faithfully,

Dec. 5, 1911. COFFEA MYSORENSIS.

[The object of the papers to which exception is taken in the above letter was not the glorification of either Coffee or Tea; it was to show planters what is being done, and what is being written. That for years past a great deal more has been written, throughout the world, in praise of Tea than in praise of Coffee, is a certainty; consequently there was been a larger supply of papers on the latter product available. It should be remembered that the *Planters' Chronicle* circulates amongst producers, and is not read by the general body of consumers in any country. Even, therefore, if it were to lay itself out to praise, or to advertise, one product and not another, consumption could not be affected. Representing the interests of *planters*, however, it endeavours to keep them in touch with the campaigning methods that are adopted in the chief markets. If Coffee men find that their Tea rivals are more active than themselves, they should not lay the blame on *The Planters' Chronicle*, which is equally ready to advocate the claims of both Tea and Coffee, but, naturally, uses the materials that are available from time to time.—ED., *Planters' Chronicle.*]

RUBBER.

Third International Rubber and Allied Trades Exposition, New York.

DATES.—23rd September to 3rd October, 1912.

LOCATION.—New Grand Central Palace Buildings, situated in 46th and 47th Streets, Lexington Avenue, New York City, and will be held under the auspices of the International Exposition Co., Inc., N. Y.

PATRONAGE.—The Exposition will be under distinguished patronage, also of gentlemen largely interested in the production, manufacture, etc., of rubber, also of scientists, chemists, etc.

VICE-PRESIDENT.—Mr. Henry C. Pearson ("India-Rubber World," New York) has kindly consented to act, and is taking an active part in the Exposition.

CONFERENCES.—Manufacturers, planters, chemists, etc., will be held under the Presidency of Mr. Henry C. Pearson.

CRUDE RUBBER.—To show indigenous and Plantation Rubber from all countries. To bring the producer into closer touch with the manufacturer and chemist, etc., to enable them to exchange ideas regarding the rubber required for the American market.

OBJECTS.—To show the great progress that has been made in the manufacture of rubber goods of every description, machinery, mechanical contrivances, chemistry as applied to manufacture.

SPACE.—Particulars with plans will be supplied. Price will include covered platform.

CUSTOMS.—All exhibits admitted duty free.

KINDRED TRADES.—The display of all descriptions of goods that come under the allied trades used in producing, manufacturing, etc. All appliances required by planters, etc.

SELLERS AND EXPORTERS will be brought into direct touch with manufacturers and will see at a glance the goods that are required by the consumer in America or abroad.

SELLING EXHIBITS.—No retail selling stands or what are called "fakir" exhibits will be accepted upon any consideration.

DIRECTORY OF EXHIBITORS WITH DAILY PROGRAMME.—This will be issued, but no advertisement will be solicited.

PROSPECTUS.—This is in course of preparation and will be mailed to those applying as soon as ready.

A. STAINES MANDERS, *Organizing Manager,*	New York City: New Grand Central Palace, 46th & 47th Streets, Lexington Avenue.
MISS D. FULTON, *Secretary.*	London: 75, Chancery Lane (Holborn), London, W. C.

——:o:——

The *India-Rubber World* observes:—

Many times has the project for an American rubber exhibition been mooted. A score of times has it been suggested, but never carried beyond the first preliminaries. That is as it should be, for certainly up to the present the time was not ripe, nor was there adequate exhibition experience behind the thought. With the projected 1912 exhibition, however, the case

would seem to be vastly different. At no time in the past has there been such a general interest in rubber. Nor has there ever been so wonderful and spectacular a trade development. The tropical world has been scoured to secure varieties hitherto unknown of wild rubber. Not only that, but science has gone out into the jungle and taught the native to do his work better, and give a cleaner, more valuable product. Law has penetrated to fever-ridden fastnesses and insisted upon sanitation and incidentally conservation of rubber-producing species. New appliances for gathering, for coagulation, have been produced by the hundred.

In the general factories of the world, in foundry, machine shop and laboratory, new machines and appliances have appeared by the thousand. American, German, English, French, Belgian and Russian inventors have been busy. Scientists in Government service or privately employed have spent years in rubber research, and are eager to put their views before the world.

The time is ripe. A gathering such as no other industry in the world could call out is perfectly feasible. A rubber exhibition, historical, broadly informing, complete, held in the United States would not only be of the greatest value to the people, but could be made to give an added and a permanent impetus to the already great industry that we have builded.

The "Seringueiras" or Rubber Trees of the Amazon.

A Portuguese Description of Rubber Gathering.

The Seringueiras *Heveas* produce the best known rubber. The basin of the Amazonian rivers is the country on which the different kinds of trees are scattered, unequally grouped, depending upon the nature of ground, altitude, its dampness, etc. There are several varieties of rubber trees. We note 21 different kinds, of which five take a prominent part (Huber).

The rubber tree "rana" or "mangue" (*Hevea guyanensis* or *siphonia elastica*) will grow in a very damp ground, nearly always inundated, situated, at the mouths of rivers. This tree does not give a very important product.

The rubber tree "branca, vermelha on preta" white, red or black (*Hevea brasiliensis*) is found in groups on the islands and at places of inundations, from the middle upward to the high parts of basins of nearly all the Amazonian tributaries. It is also found on solid ground (especially the red variety, which is the least milky) and in places filled with dampness during most of the year. This rubber tree produces the largest quantity and the best class of Amazonian rubber.

The rubber tree "puca" (*Hevea viridis*) yields latex of an inferior quality. The rubber tree "barriguda" (*Hevea spruceana*) is frequently encountered on solid and high ground, between the two rivers and in the vicinity of the interior lakes. The latex is not of a good quality, but is used in the mixture of other better varieties of rubber.

The rubber trees "itauba" or yellow (*Hevea Cuneata*), which produces a rubber of good quality, lives best on high, dry grounds.

The rubber trees are found in nearly all the Amazonian territory, from the sea level up to the altitude of 600 metres (about 2,000 feet) and more, but the best quality is encountered on the islands lying at the mouths of big rivers, and in the high basins of the principal Amazonian tributaries, principally the Madeira, the Purus, the Jurua, the Javary and their own ramifications.

The longevity of the rubber tree is not known exactly—it may live 100 years or more. The milk production accumulates with the age of the tree

and therefore its value is increasing with age. Barring accidents or sicknesses, which are very rare, the rubber tree being less inclined to sicken than any other domestic tree, it is supposed to live the time mentioned above. Compared to a gold mine, the rubber tree is much more valuable, because every dollar of profit that is drawn from a mine represents a depreciation in its value, whereas with every year, the rubber tree will augment its production of a better quality. It is an inexhaustible mine, without limits. The rubber tree is an automatic augmentation of profits. With every year's production these profits are increased without depreciating the value of the tree. The rubber trees develop into majestic trees growing tall and straight. At the blooming time, the air of the seringual (rubber plantation) produces a very agreeable perfume attracting swarms of bees and other insects in. Four months after, the seeds begin to appear in hanging clusters. During the hot season there is a discordant concert of a fantastic musketry in the seringual which is produced by the cracking burrs, opening themselves and scattering seeds in all directions.

For the exploration of the rubber, the first duty consists in opening the estradas, which are opened by the mateiros, who are experts on rubber trees.

The estradas are supposed to hold about 120 to 180 trees (*Heveas*), forming as nearly as possible a circle or a figure 8, in order that, starting from any part of the estrada, the seringueiro will always find his way back. There, the seringueiro builds himself a hut covered with "Paxinba or Ubussu" that protects him poorly against the elements.

Besides these huts, which are located in the working estrada of the seringueiros, there is the "Centro or Barracao do Patrao" (or the house of the foreman), containing generally a shop, where commissaries, munitions and working tools are supplied, and where all the rubber of the estrada is gathered.

The working material of the seringueiro is very simple and cheap. The necessary tools are: A small machadinha, weighing 125 grams (4·4 oz.), having an edge of 0·25 mm. (0·01 inch) to which a handle is affixed, the length of which depends upon the necessities of the work; a zinc bucket of 6 to 8 litres (1·58 or 2·11 gallons) to gather the latex, 500 to 600 tijellinhas (tin cups) with a capacity of 200 cubic centimetres (12·2 cubic inches) and a basin of zinc, were the contents of the buckets are deposited before the defumacao (smoking).

The work starts early in the morning, the seringueiro armed with his machado and carrying a bag of tijellinhas (tin cups) on his shoulder, is exploring the estrada and works at each tree, as high as possible, cutting oblique incisions (taking the upward direction) through all the thickness of the bark. Below each of these incisions he immediately inserts a tijellinha, introducing its edge by an inside depression into the bark, or he hangs it up with damp argyl.

The number of horizontal incisions varies in accordance with the thickness of the tree. At 10 a.m., when the dropping has nearly ceased, the seringueiro leaves the hut again with the bucket in which he pours the contents of all the tijellinhas and which he leaves at the bottom of the tree upside down on small sticks which are standing in the ground for this purpose. When returning to the "centro" the defumacao is started.

The smoker, protected from the weather by a few palm leaves, is placed near the hut. It is a straight truncated cone generally made of iron 50 centimetres (19·68 inches) wide. The seringueiro places it on two stones,

and builds a fire underneath feeding it with "cocoa" (the urucary or the inaja) which, on account of its rich smoke containing antiseptical qualities, coagulates the rubber. It is with a kind of cane terminating in a round and straight shovel, similar to the paddles of the canoes used on the Amazon, which lies on a pitchfork at the bottom of the fire, that the seringueiro makes the defumacao (smoking process). First he passes this cane over the smoke then dips it in a basin close by, which is full of latex, passes it again over the smoke and the first layer appears to be coagulated, then, with a cuia (cup or gourd) he throws over that another layer and so on successively till the pelle is formed, which represents a ball weighing approximately from 6 to 8 kilos (13·2 to 17·6 pounds), or from 30 to 35 (66 to 77 pounds) at the heaviest.

The well defumated rubber is called "borracha fina" (fine rubber). The rubber by which the coagulation has been badly made, or by which the defumacao (smoking) took place a little late, when the milk was already a little coagulated, is called "borracha entrefina" (enterfine rubber).

The sernamby rubber is the naturally solidified rubber, on the ground, in the trees, in the tin cups, in the buckets, etc. It consists of threads or pellicles, mixed with more or less earth refuse or other foreign substance. Its value is estimated to be 30 per cent. less than the fine rubber.

The harvest and the smoking, in other words, the manufacture of the rubber, lasts from six to seven months a year and during the other months of the very dry season the trees are not touched. At the overflowing time the harvest is rendered impossible on account of the waters inundating the igapos. It is calculated that the average yield of each tree is 44 grams (1·55 ounce) of latex per day, but one rarely gets more than 5 kilos. (11 pounds), which per man represents yearly 450 to 500 kilos. (900 to 1,100 pounds) fine rubber and 90 kilos. (198 pounds) of sernamby.

After the manufacture, the rubber is taken to the hut of the foreman, and from there sent to Manaos to the aviador, who is the supplier of the provisions and of the goods to the seringaes, and who, for the most part, is the real proprietor of the seringal.

From the aviador the rubber is sold to the exporters who send it to the consuming markets of the world.

These exporters are people who make the "beneficiamento," consisting in opening the pelles, in qualifying them (rubber fine and entrefine) and in packing them up in solid pine cases to be then embarked at the Manaos Harbour on board the transatlantics, which take it to the ports of destination.—*Revista Literaria Artistica.*

The Bleeding Rubber Tree.

A planter in Johore sent some time ago an account of a rubber tree which continued for a long time to exude latex without any apparent reasons. Possibly, observes the *Agricultural Bulletin of the Straits and F. M. S.*, other of our readers have come across similar instances.

The tree is, he says, a well grown tree, originally a seed planted at stake in October 1908, growing on a very old grey clay flat on the edge of a drain. The girth of the tree on August 17, was 12 inches at three feet from the base. On three occasions I have dug out large lumps of rubber from the base of the tree. "The first time was a year previously and the last at the date of his letter, when he obtained 2 pounds of rubber. The roots of the tree are quite healthy and the tree by no means too heavy, the branches not too large for the tree to support and there is no reason to suppose that the tree has had a wrench from a high wind. The latex oozes from the point where the large roots proceed from the collar of the tree. The latex

also gushes out at a point where one of the branches joins the main trunk and runs down the stem.

This bleeding has been going on for a whole year, and yet the crown of the tree looks perfectly healthy and has put out fine new shoots. There is not a dead branch on the tree nor an unhealthy looking leaf. He remarks that at the rate of rubber production in this way, it would be satisfactory to have a number of such trees, as it only took him two minutes to dig out 2 pounds of wet rubber, and a cooly could collect 150 pounds a day at a cost of 50 cents, *i.e.*, a third of a cent a pound, and even cheaper on contract rates.

Manuring for Rubber.

Mr. L. Lewton Brain writes in the *Agricultural Journal of the Straits and F. M. S*:—

The Department of Agriculture has recently been asked by a number of planters to advise as to what manures to apply to rubber trees and in what quantities they should be used.

On the majority of plantations it is doubtful whether any manuring is required. There are a number of places, however, where the growth or the general vigour of the trees is not equal to that on others. In these places, provided it is not the cultivation or the drainage that is at fault, manuring may prove of advantage.

Cultivation in most places will be found of greater advantage than manuring. If every rubber field could be changkolled twice a year or receive an equivalent cultivation with ploughs, disc harrows, etc., it is certain that both the immediate and permanent benefits would be great. Of course with old trees which have formed an interlacing root system near the surface of the soil such cultivation would be dangerous, but with young plantings cultivation is strongly recommended. On fairly flat lands which have been thoroughly cleared of timber and stumps, probably mechanical cultivation by ploughs or disc harrows will be found more economical and more effective.

The following recommendations for manurial treatment have been drawn up by Mr. B. J. Eaton, Agricultural Chemist, Federated Malay States. It must be borne in mind that they are based on general principles and are not the result of experiments. Manurial experiments have been started by the Department of Agriculture, but reliable results will not be obtainable from them for some years. It is proposed to publish similar notes for other types of soils.

MANURIAL TREATMENT FOR PARA RUBBER ON HEAVY CLAY SOILS.

The following treatment is to be recommended for clay soils :—

Slaked lime	½ to 1 ton per acre.
Basic Slag (phosphate manure) ...	340 lbs. per acre.
Ammonium Sulphate	150 ,, ,, ,,
Potassium Sulphate	100 ,, ,, ,,

The lime and basic slag should be applied about a month or two months before the other manures as they decompose Ammonium Sulphate.

The Ammonium Sulphate and Potassium Sulphate should be mixed together and then mixed with earth and subsequently spread.

If concentrated manures are used they frequently injure the roots with which they come in contact, and the earth is added as a diluent.

With trees one or two years old it is preferable to dig a shallow trench (4 to 6 inches deep) at a radius of 2-3 feet round the tree, sprinkle the manure round and subsequently cover with earth again.

With older trees, where the roots interlace, the manures may be broadcast and the whole surface forked over.

The following can be used in place of Ammonium Sulphate :—

Castor seed cake, or
Linseed cake, or
Cotton seed cake, or
Pará seed cake, or
Ground-nut cake.

These should be applied at the rate of about 600 lbs. per acre. If it is found that the cost of the quantity recommended is cheaper than the Ammonium Sulphate, I would recommend their use. Instead of Potassium Sulphate may be employed :—

Kainit (12 per cent. Potash) 400 lbs. per acre, or
Potassium Chloride 100 lbs. per acre.

The cost of the above quantities should be compared with that of 100 lbs. of Potassium Sulphate.

Instead of Basic Slag, Perlis Guano or other Phosphatic Guano may be substituted.

Perlis Guano (containing 15 per cent. Phosphoric Acid) at the rate of 500 lbs. per acre, should be very economical, as its price is only $25 per ton.

In the first instance as a trial I would suggest the use of the most economical fertilizers, until more is known of the different effects on the Pará rubber tree on different soils of the various nitrogenous phosphatic or potash fertilizers.

The average cost per acre of the above formula excluding lime, will amount to $20 to $25 per acre. This does not include transport, freight or labour.

Lime can be purchased at 80 cents to $1 per picul.

In Sierra Leone.

Mr. G. B. Hadden Smith, C. M. G., Colonial Secretary for Sierra Leone, in his annual report for the year 1910, states that the trade in rubber continues to decline. In 1910, 21 tons of the value of £7,666 were exported, as compared with 26 tons of the value of £8,079 exported in 1909. The exports in 1908 were 41 tons; 1907, 72 tons; and 1906, 107 tons.

During the year under review the prices paid for this article were higher than those reached at any time during 1910, but in spite of this the quantity exported has been steadily diminishing; the fact is that the suicidal methods of root-tapping adopted in past years by ignorant rubber collectors have either killed outright, or seriously retarded the development of the rubber trees. The Government is taking steps to stop the system of root tapping, and it is stated that the natives have received little encouragement in this matter from the traders, the principal exporters declining to purchase rubber obtained in this way.

It is anticipated that when the damaged trees have recovered the shipments will increase, and by that time the natives will have realised the evil effects of their short-sighted policy; but it will be some years before Sierra Leone takes its place in the world as a rubber-producing country.

FUNGUS NOTES.

Wounds in Plants and their Treatment.

PART I.

Under the term Wound is included any destruction or removal of the living tissues of plants, whether by natural or artificial means. All plants whose aerial structures endure for any length of time are provided with a hard, dry outer covering layer, which serves to protect the inner tissues from the attacks of other plants, such as fungi, and of some at any rate, of the members of the animal kingdom. In trees and shrubs belonging to the great class of Dicotyledons, this covering is known as the bark. It arises through the activity of a special layer of growing cells situated in the cortex. This layer gives rise to two kinds of cells. On the inside new living cortical cells are formed, on the outside cork cells are produced. These have special walls which are impervious to the passage of water, and in consequence, the cells outside of them die. The mass of dry, thick-walled cells serves, however, to protect the inner tissues, since it is resistant to the attacks of bacteria and fungi, which can destroy readily the soft-walled living cells. Soft green plants and parts of plants are protected by the outer thick walls of the cells composing the skin or epidermis, but this protection is not so thorough as is that afforded by the bark.

It will now be apparent that the chief danger to plants attendant upon wounding, is the exposure of the inner unprotected tissues to the attacks of parasites, which may ultimately cause their death. In order to obviate this, dicotyledonous plants attempt to re-cover the wound with bark, and the degree of success attendant upon this endeavour depends largely upon the size of the wound, its nature, and the general conditions to which the plant is subjected. The covering is formed by the growth of the cambium at the edge of the wound by which means a plate of tissue is produced which extends totally or partly over the exposed surface. This plate is known as a callus.

Natural wounds are those caused by the falling of leaves, fruit or twigs, when these are purposely cut off by the plant itself. They do not form a source of danger to the tree, since prior to the fall of the parts removed, a special corky layer is produced over the inner tissues, which their disappearance would otherwise leave exposed.

Artificial wounds are due to several causes, among them may be mentioned the action of wind, of animals of all kinds including man and of other plants, such as fungi. They comprise all wounds made in pruning or in removing diseased tissue.

INTENTIONAL WOUNDS.—Under this head are included all wounds made in pruning or in removing dead or dying parts of plants. Such wounds are often necessary for various reasons, though it is undoubtedly a great mistake to prune more than is absolutely required for the best growth and development of the plants; or in the case of trees grown in cities, for the convenience of the general public. In the case of permanent crops in particular, such for example as cacao, limes and Pará rubber, the extent of the pruning given should never be greater than is shown by experience to be inevitable, and the operation itself should be conducted with all due care.

In the old days, before the principles underlying careful pruning were fully understood, little attention if any was paid to the method employed. At the present time, however, certain fundamental principles are fully recognised. In the first place, it has been found that trees can entirely cover over any wound, caused by the removal of a branch up to 4 inches in

diameter, if it is cut off so that the exposed wood presents a smooth surface flush with, and parallel to, the bark of the trunk. Small branches should, therefore, be removed with a saw as close to the surface from which they arise as is possible, the cut passing through the bulge at the base of the branch. The surface may then be furnished with one of the protective coverings which are described below. This prevents the entry of organisms causing desease, until the bark has entirely covered the wound.

When a large heavy branch has to be removed, it is not safe to commence sawing it away directly. If this is done, the branch often breaks from its own weight and tears a large portion out of the stem, making an ugly irregular wound that is difficult to protect. To avoid this, a cut should first be made on the under side of the branch at about one foot from the stem and extending nearly half-way through the branch. Then a second cut should be made on the upper surface about 3 inches further from the stem, and should be continued until the branch falls off flush with the stem. The exposed surface must then be protected as is mentioned below.

Another kind of wound involving an actual cutting into the tree may be necessary when diseased patches such as are caused by canker have to be excised, or when boring insects like the cacao beetle have to be removed. Such excisions should be done with a chisel or gouge and a mallet; all diseased tissue should be cut out and the treated surface smoothed off and covered.

COVERING WOUNDS.—Various preparations have been recommended for protecting cut surfaces. One of those in most general use is, perhaps, tar. Ordinary coal tar is the only form that can be recommended; Stockholm tar is too thin and evanescent. Tar has, however, one drawback, namely that it kills the tissues round the edge of the wound and thus delays healing, while it also kills portions of the bark if it is allowed to drip on to them. A better substance is resin oil, which does not appear to exercise any harmful effect on living tissues. The drawback to this is that it cannot be seen easily what wounds have, and what have not, been treated. This difficulty may be overcome by mixing four parts of the oil with one of tar, when the tar renders the treated wounds readily distinguishable. An excellent substance for covering wounds that are expected to heal over entirely is a mixture of 2 parts of clay and one of cow-dung, with the addition of a little hair. If the entrance of wood-boring beetles is feared, a few drops of carbolic acid should be added to the mixture. Another covering substance that has given good results is white paint, while Petch suggests the application of the sediment formed when Bordeaux mixture is allowed to stand; this should be applied as a layer about $\frac{1}{8}$ inch thick. Yet another mixture is stated by Petch to have been recommended in Germany as a cheap protective for large wounds, and has been subjected to experiment there. It consists of 500 grams of melted white resin, 500 grams of wood tar, 125 grams of printers' varnish (linseed oil varnish), and 60 grams of spirit.

Large wounds caused by the removal of big branches or the excision of cankered areas cannot be expected to heal over entirely. Petch suggests the following treatment in such cases. Round the edge of the wound over a strip 1 inch in width, which is likely to become covered by the wound callus, the mixture of clay and cow-dung should be applied. The central portion should then be covered over with tar, resin oil, or one of the other substances mentioned above.

PART II.

In the last number of the *Agricultural News* some account was given of wounds of plants. In the present article, some kinds of accidental

wounds will be discussed, with their treatment, and a few points will be considered which arise in connexion with the whole subject.

ACCIDENTAL WOUNDS.—In temperate and cold climates, several natural agencies, such as frost, hail and wind, are responsible for wounds on trees, but in the tropics wind is the only harmful factor in this class that is of any importance. Very strong winds often break off large branches, or cause splitting of the trunk at a fork where a large branch is riven off. Less serious winds damage young foliage and soft green twigs, and give rise to the appearence known as die-back or stag head. When a large limb is torn out of a tree by wind in such a way that there is no danger of the torn surface holding water, the exposed wood should be smoothed down and covered with one of the preparations described in part 1 of this article. If a hollow is left in which water will collect, and there is no means of preventing this by cutting a draining channel, or by smoothing away the side of the hollow, then the hole must be filled up with cement, and surface of the cement must be smoothed off at such an angle as will enable water to run away.

Splits in the trunks of trees, which arise where two large branches fork, may be closed up in the following manner. An iron bolt should be driven through either branch at some distance above the fork. A tarred wad may be pushed through at the same time by the bolt to protect the tissues exposed by the augur in drilling the hole for the bolts. The ends of the bolts on the outer side of each branch should carry a thread; on these a flat plate may be held in position by means of a nut. The inside ends of the bolts should be connected by a strong chain. By screwing up the nuts the two branches are forced together and the split is closed. It is advisable to apply a thick coat of tar to each of the exposed surfaces before closing the split.

In the case of cacao or lime trees severely damaged by wind, the question often arises whether it is advisable to treat the damaged trees, or whether it is preferable to allow them to be replaced by a sucker or a new tree. This is a question which each planter must settle for himself, under the conditions with which he finds himself confronted. Larger trees grown for ornamental purposes are often difficult to replace and may be successfully treated in the manner described above.

Abrasions are often caused by the rubbing of one branch against another. In this case one of the branches should be cut off and the damaged surface of the other should be treated with some protective covering, as also should the cut end of the branch be removed. Young twigs killed by wind should be removed by pruning.

Among the injuries inflicted by animals mention may be made of those due to the gnawing of rats and agoutis. Such wounds should be treated in a manner similar to that employed for cankered areas.

Small sucking insects injure the surfaces of leaves and green twigs and encourage the entrance of parasitic organisms, but the remedy against them lies rather in the destruction of the insects than in the treatment of the minute punctures which they inflict.

Again, wounds may be caused by other plant organisms, parasitic fungi and bacteria. The treatment for these involves pruning and excision, and has been considered already in the previous part of this article.

GENERAL CONSIDERATIONS.—In dealing with the question of wound treatment in general, it must be borne in mind that the trees in a permanent cultivation represent capital, and as such, are worthy of the exercise

of all reasonable precautions for their protection. Careless workmen, particularly rubber tappers, cacao pickers and men engaged in cutlassing and forking, may well cause very serious diminution in that capital. Every encouragement should, therefore, be given to such workmen to attain proficiency in their work, while at the same time very strict supervision should be exercised over them, especially when they are engaged in tapping rubber or picking cacao.

On large estates, much can be done to maintain the general health of the trees, by training very carefully a special gang of pruners, chosen for their neatness and care as workmen. There is always enough work on a large estate to employ fully at least one such gang of three or four men throughout the whole year, and even if this class of work should call for high wages, the money spent would be amply repaid by the benefit to the trees; while it should be looked upon only as a reasonable insurance against any heavy loss of capital. The members of the gang should be trained not merely to carry out the pruning operations necessary in all permanent cultivations, but also to treat adequately all forms of wounds to which trees are liable. The employment of such a gang is very strongly advocated by Petch, in Ceylon, and is actually adopted on some of the larger rubber estates in the East, as well as on certain cacao estates in Grenada.

One other point worthy of consideration is the extraordinary amount of wilful damage inflicted on trees by human beings, particularly in the West Indies. This is apparently an evil which must be tolerated, since there does not seem to be any remedy likely to have any immediate preventive effect upon it. Something may be done in course of time by dint of carefully instilling the idea of the value of plant life into children, and in this Arbor Day may play a useful part, but this course must of necessity be slow in its action. One form of damage to trees growing in public places might, however, be prevented; namely that caused by nailing advertisements upon them. This could be checked by stringent legislation.

The Coffee Trade.

Total visible supplies on November 1 were 13,122,000 bags, compared with 14,840,000 bags last year. During October the total stock increased by 739,000 bags, which would almost suggest that the present very high prices are scarcely warranted. A very unsettled tone governs the terminal market, which is influenced more by future crop prospects than by the present position. Coffee has not been so dear as now for about fifteen years. The low prices which ruled up to two years ago were due to a succession of very large crops, but the outlook has vastly changed, there having been a great depletion of stocks following on a succession of dwindling crops. In Europe and the United States speculative dealings have lately been very large at widely fluctuating prices. Conditions arising from the reduced crops have played largely into the interests of powerful speculative parties in Santos, who practically command the position and are able to dictate their own terms. The present Rio and Santos crops have not come up to expectations, and the outlook is rendered worse by the next crop promising a smaller outturn, the flowering having been very irregular.—*Grocer*, November 11, 1911.

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H. M. Vice-Consul at Guatemala (Mr. G. D. N. Haggard) reports under date 13th October, that the 1910-11 coffee crop in Guatemala amounted approximately to 720,000 quintals of clean Coffee. Forecasts of the crop for 1911-12 range from 600,000 to 800,000 quintals, the somewhat unusual weather conditions that have prevailed lately having made it difficult to say, with any degree of certainty, what the yield will be.

Quintal=101·4 lbs.

SELECTED CUTTINGS.

The Spirit of Agricultural Investigation.

Those who are responsible for agricultural investigation and experimentation at the present time are faced by the fact that the field over which their energies may be expended has largely widened in recent years. Agricultural problems are no longer regarded as being comparatively small in their scope and simple in their nature. They require the assistance of many of the so-called branches of science. The help of the chemist, the botanist, the plant pathologist, and physiologist, the entomologist, the geologist and the physicist, large as it is, does not exhaust the amount of aid that is needed by the agricultural investigator.

This circumstance has led to the existence of the worker who specialises in one or two of the many matters that must receive attention for the elucidation of agricultural problems. He does not necessarily go into the field, nor need he be an agriculturist, in the ordinary sense of the term. His work may be purely academic; nevertheless, it is required by the practical experimenter, who has not the time, and probably does not possess the knowledge, to enter into specialized scientific investigations. Further, the attitudes of the two kinds of workers are different: the specialist directs his gaze towards what is waiting to be found out, while the maker of agricultural experiments gives his attention to results already obtained, in order that they may be endowed with a practical value.

While the latter kind of investigator is a user of existing results it is the purpose of his work, as has been indicated, to employ these for obtaining others that are applicable on a larger scale. He must therefore, be in possession of a definite scheme of working. It is his duty, also, thoroughly to master the necessary preliminaries before he proceeds to put any scheme into operation. An important matter among such preliminaries is the gaining of an adequate knowledge of what has already been discovered in relation to the subject. It is too often the case that ground is covered by one investigator, in ignorance that it has been traversed already, and to an adequate degree, by another, with consequent waste of time, resources and energy. It should hardly be necessary to point out that the provision of a central agricultural organization possessing a wide knowledge of agricultural matters and the power to direct the energies of the officers under its charge forms the most useful means of preventing the loss that arises in this way.

One necessity for the experimenter is the possession of the imaginative faculty. He must be able to take a broad view of the field in which his activities are to be confined, so that he may see plainly where his work is required, and be able to devise the best methods for experimentation. Without such a view, he will be likely to make his research a matter, merely of attention to inconsiderable details.

He also requires patience. In agriculture, particularly, years of careful observation and many repetitions of experiments are generally needed before any dependable results can be obtained. Attention may be drawn, for illustration, to manurial experiments, particularly with sugar-cane and cacao, that have been carried out during long periods in the West Indies.

Another requisite is a proper realisation of the necessity for the fair and honest presentation of his results. As far as is humanly possible, the direction of the experiments and the presentation of what they appear to demonstrate in fact should be free from bias arising from preconceived theories. There should be no ignoring of indications contrary to existing ideas: nor on the other hand, should too great a stress be laid on isolated

circumstances that appear to give support to some favourite theory. Theories of the latter kind will often have to be discarded, and there should be no hesitation in dismissing them from further consideration, once they have been proved untenable.

The advantage of the fair treatment of results appears in another light. It may lead to the forming of conclusions that are of the greatest use, although totally unexpected. Such conclusions are of all the more value because they have been formulated after ignorance of their existence and in the consequent absence of bias in their favour.

In presenting reports of work, much care should be taken that such presentation is effected with the greatest clearness, and fairness to the evidence that is available. Where this is the case, the clearness of the account is of the largest use to other experimenters and may even enable them to elucidate useful facts, in connection with their own work. The importance of this indirect use of negative conclusions will be evident.

Where positive results of certain application have been obtained they have two uses. The first is the obvious matter of their utilization in existing circumstances, the second is their employment to suggest other lines of work. Such results actually have their place in a larger scheme; they comprise a necessary step for its completion. The provision of all the results in the scheme are in the hands of no single investigator. One takes up the work where another leaves it; but the conclusions reached by those who succeed the pioneers could not have been obtained without the existence of the preliminary conscientious investigations.

Lastly, the use of the results of experimentation is not confined to the line of work in which they have their special place; it exists for other, probably quite dissimilar, interests. It was not obvious that the observation of Cavendish, that the oxygen and nitrogen of the air unite in the presence of an electric spark, would be a necessary preliminary to obtaining an artificial manure, using the nitrogen of the atmosphere; the agriculturists of the time did not regard the work with bacteria, of Pasteur, as the commencement of studies which would lead to the devising of proper systems of tillage and agricultural conservation.

The agricultural investigator has before him a large field of work. He cannot enter it alone. He must survey it with open mind, and decide which part of it to occupy; for this he will most probably require the guidance of those who can more easily see how his work must be correlated with that of others. Lastly, he will find it partly occupied with the results of former activities. These he will employ for the conduct of his researches, in order that he may leave at least something of use to those who will take the place in which he once laboured conscientiously.—*Agricultural News.*

The Ceylon Observer of November 25, 1911, remarks:—"Mr. C. E. Welldon has just returned from a very interesting visit to Java, Sumatra, Johore and the Malay States, seeing much of Robusta Coffee, Tea, Rubber, and Cocoanuts. He was greatly impressed with the tea in Java and considers that Pará rubber in suitable districts in Java will be as good as any rubber in Sumatra or the Straits. Fever on some of the best plantations has been severe, but all possible provision is made for the health of the Managers, employees and coolies. . . . He stated that the profits on Robusta Coffee in East Java are very large and that up to date leaf-disease has not done harm and is not reducing the crops, so we may hear more of this product during the next few years.

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Labour Problems in Assam.

Assam has its Labour troubles, just as South India has, though they are not of quite the same kind. At a meeting of the Assam Branch of the Indian Tea Association, held at Cinnamara on the 28th ultimo, the Hon'ble Mr. W. Skinner, the Chairman, explained the position. The Government of India have notified that from July 1913 the provisions of Act VI should be withdrawn from the Assam Valley, as they have already been withdrawn from the Surma Valley. "This means," said Mr. Skinner, "that the protection afforded by a long series of Labour Acts from 1870 onwards, which have all embodied the law that an imported labourer, provided that he is well treated, must not leave the garden to which he was imported before the expiry of his contract,—unless he chooses to redeem it by a money payment —will cease to be applicable in every garden of the Assam Valley." It will be permissible to import labour under Section 492, I. P. C., or to place it under Act XIII of 1859 after arrival in the Province, "but neither of these gives anything beyond a moral protection, and as under both a conviction operates as a release, the security to cover the importation expenses is not only extremely precarious, but is practically valueless."

Of a suggestion that there should be Free Labour, with Act XIII unamended to be used, at option, after arrival in the Labour Districts, Mr. Skinner observed that Free Labour entails Free Recruiting, devoid of all restrictions in any part of India as well as in the Labour Districts, and, as Government will not agree to this, "only a part of the system becomes applicable, and that part which offers no advantages but enormous risks to the importer." As the sole practicable solution, the Committee of the Assam Branch of the I.T.A. suggests a Local Act, to provide that Labour imported shall be, for a period sufficient to cover the cost of importation, protected from wilful breach of contract and from enticement outside. Government, however, are unwilling to adopt this course.

The problem of Labour in Assam remains unsolved for the present, but the Meeting referred to adopted a resolution approving the appointment of a salaried temporary Secretary "to tour round all Districts, convene Meetings, and explain the position." This Secretary is to "attend the meetings of all Sub-Committees convened for the purpose of discussing the Labour Questions now pending before the Government."

By this means it ought certainly to be possible to bring planters round to an agreement regarding general lines of policy and as to concerted action.

SECRETARY'S PAPERS.

V.—Notes on Bee-Keeping.

At the last annual meeting of the U. P. A. S. I. the Planting Expert suggested that it was well worth while to try the effect of bee-keeping in connection with coffee planting. The important part that bees play in a successful setting of blossom was alluded to by Mr. Charles Dickins as admitted by all interested in agriculture; and a resolution was adopted: "That Government be asked, through the U. P. A. S. I., to pass some rules prohibiting the destruction of bees in planting districts."

A desire to place before planters some useful information on the subject of bee-keeping has led to a search through many papers, and to the conclusion that there are various points of the first importance respecting which little of value can be stated at present. Further practical investigation is urgently needed, and such as is now being carried on deals rather with bee-keeping as a source of income than with that aspect of the subject which is of more immediate interest to planters.

In Ceylon, the normal way of securing honey is by robbing the hive of the wild bee, after driving out the swarm by means of the irritating smoke arising from burning chillies or peppercorns. A more rational system of bee-keeping has been tried, and during the last few years the Ceylon Agricultural Society has been encouraging amateur Bee-keepers to co-operate as members of a Committee whose object has been to popularise the latest methods of agriculture. and its efforts have not been without success. It is stated that the only local honey bee that lends itself to "cultivation" is that scientifically known as *apis indica.* The great "bambara" bee, *apis dorsata,* which builds a gigantic hive, while an excellent honey-gatherer and wax-maker, cannot be reared in modern hives, not so much owing to its vicious propensities, but from the fact that it builds a single comb, and that in the open.

There is certainly a little encouragement to be derived from the perusal of "Bee-Keeping in Porto-Rico," a circular issued by the Porto Rico Agricultural Experiment Station, for this states *inter alia*: "The Coffee planters particularly have become interested in the raising of bees, not only for the honey but because bees are very useful in pollinising coffee in seasons when there is a great amount of rain during bloom. The pollen in the coffee is carried by the winds from flower to flower, but, if there is much rain, very little bloom is set, as only the dry pollen is carried by wind: during rainy periods the bees visit the flowers and distribute the pollen in their honey gathering. Coffee plantations also afford excellent fields for bees to work in, as honey is obtained from the coffee shade as well as from the coffee itself." But "at the present time the honey industry of Porto Rico is in its infancy," and no doubt the same remark applies to bee-keeping that has for its object to assure pollinisation among the coffee plants rather than to procure honey for the table or the market.

Porto Rican records, like those relating to India, are very vague when the subject of choice of bees is touched upon. This is one of the points to which attention is naturally directed at the very outset; and the information forthcoming is unsatisfactory.

In the *Indian Agricultural Journal*, October 1911, there is an article, by Mr. T. Bainbrigge Fletcher, R.N., F.E.S., F.Z.S., Offg. Imperial Entomologist, that might almost be described as typical of the kind of literature dealing with bee-keeping that is at the disposal of the would-be apiarist. It contains valuable matter, but its limitations are narrow, and its contents, as a whole, might be said by an Irishman to accentuate the *lacunae* rather

than the text. Moreover it is not written for the guidance of the coffee-planter. The following lengthy extract is quoted, however, more particularly because of the information it gives about *Indian* bees :—

"A brief summary of what is being done at Pusa in the way of bee-keeping will probably save a great deal of correspondence. We have in India three common kinds of wild honey-bees:—

"(I). *Apis dorsata*, a very large species which lives in the hills and the damper regions of the plains, and makes a single large comb which may measure four or five feet across and which is usually hung under the horizontal branch of a tree or amongst rocks. This bee does not occur at Pusa and we have not experimented with it, but it has the reputation of being very fierce and untameable and its habit of building only a single comb makes it difficult to work with.

"(II). *Apis indica*, a species slightly smaller than the European honey-bee but very similar to it. This builds several parallel combs generally in a hollow tree, and is kept in a state of semi-cultivation in some places, notably in Assam, boxes being placed for the swarms of wild bees to occupy. This bee has been tried at Pusa, but we have not found it at all satisfactory as it seems quite unable to withstand attacks of wax-moths, which tunnel the combs to such an extent that the bees desert them in disgust.

"(III). *Apis florea*, a very small bee which hangs its small single comb in trees and bushes and on buildings. The honey is excellent, but the whole comb is so small as not to repay cultivation, especially as this bee also suffers badly from wax-moths and is therefore difficult to keep.

"In the hills, a variety of the European bee is kept at Simla and other places, but this bee does not do well in the plains—at least, those which were brought to Pusa proved a total failure.

"We have been experimenting at Pusa with a new kind of bee which we hope will do well in the plains of India; up to the present it has proved a success, but we shall require a great deal more experience of it under hot weather conditions before we shall feel justified in recommending it to inquirers.

"At the present time there is no race of bees which we can recommend to would-be bee-keepers in the plains of India.

"Of the native races, *Apis indica* seems to offer the best chance of success, but the bees should be kept in proper frame-hives and this means that everything will have to be done on a scale different from the standard adopted for the English honey-bee; for example, the combs will have to be differently spaced and the foundation and queen-excluders will require to be of different sizes, necessitating special machinery to make them.

"In any case bee-keeping can only be recommended as a supplementary source of income and not as a sole means of livelihood. Anyone who contemplates embarking in this pursuit is strongly recommended to do so on a small scale only; two or three hives are sufficient to start with, and this number may be increased as experience is gained."

To the above may be added the following reprint of a leaflet that was issued last year by the Department of Agriculture, Punjab, under the title of "Practical Hints for Bee-Keeping in Simla." :—

"1. The object of this leaflet is to indicate the outfit required for a single hive and where the various articles can be obtained; to recommend a few publications which can be usefully referred to on the subject of bee-keeping, and to add some practical hints specially applicable to the Simla Hills.

"2. The articles needed for a single hive are as follows:—

Name of articles.		Approximate price.	Where obtainable.
(a) One frame hive with eight frames and two dividing boards ...		10 0 0	The Secretary, Bee-keepers' Association, Simla, will assist or give the name and address of suppliers.
(b) Bees. One swarm with queen ...	From	3 0 0	
	to	4 0 0	
(c) Quilt and cloth for covering bees...		0 8 0	
(d) Eight sheets foundation for brood.		6 0 0	
(e) Smoker:—			
(1) best quality ...		6 0 0	Messrs. Plomer and Co., Simla.
(2) Second quality ...		4 0 0	

"The above is all that is necessary for a beginner. He need only start with two sheets of foundation instead of eight. Two sheets of foundation if cut in half will fill four frames and give the bees ample foundation to work on. It may be possible to reduce the cost of (a) by having boxes adapted.

"3. General information on bee-keeping is contained in:—

"Modern Bee-keeping Handbook for Cottagers,' by T. W. Cowan. Price six pence, Publishers. Longmans, Green & Co., London; obtainable through Thacker, Spink & Co.

"The Bee-Keepers' Record,' published monthly at 10, Buckingham Street, Strand, London. Annual subscription, two shillings and six pence,

"The first named book should be studied by all intending bee-keepers. It gives very simple, reliable and complete information.

"4. The following points should receive attention in Simla:—

i. The best season to start bee-keeping in Simla is in April and May. The bees swarm in April and are cheapest then, while in May the villagers cut out their honey and sell their bees.

ii. Purchasers should not pay for a swarm till the bees have settled down to work, this proving that there is a queen. This can be seen a couple of days after the hiving of the swarm. The Secretary of the Simla Bee-keepers' Association is in communication with men who have been taught how to handle and bring in swarms and he can render assistance in this matter.

iii. One frame hive is sufficient for a beginner. From one hive he should get at least three swarms in the spring.

iv. Bees should not be kept in the vicinity of sweetmeat sellers' shops, as the bees are apt to obtain sugar from the sweets in preference to collecting nectar from flowers. Honey obtained from sweetmeats is very inferior.

v. Sugar, sweets or honey should not be kept near the hive.

vi. The legs of the hive should stand in platters of water, as a defence against centipedes, ants and other objectionable insects.

vii. The surroundings of the hive should be kept clean.

viii. The bees should be fed with syrup when the weather is bad, but beet sugar should not be used, as it gives the bees diarrhoea.

ix. Saucers containing pure water should be placed near the hive and pieces of cork floated on the water on which the bees can alight.

x. The aperture of the hive should only permit of one bee entering at a time. This will help to exclude robbers.

xi. Care should be taken that the frames in the hive are properly and evenly spaced to ensure that the comb is even and thus facilitate the extraction of honey and examination of the bees.

xii. In examining bees, the quilt should be lifted quietly at one corner. If the bees appear happy, the quilt may be removed and the frames lifted out one by one. There must be no jarring, every movement should be calm and deliberate. Bees very soon recognise their owners, and rarely sting unless seriously provoked. Should the bees appear restive, a puff of smoke from a smoker will soon quiet them. A nervous bee-keeper should start with a veil, a smoker and a pair of gloves. But after a few visits he will dispense with these.

xiii. The bees should be disturbed as little as possible.

xiv. The hives should have daily attention. Many of the difficulties which arise can be prevented if taken in hand at once. Usually, however, all that is required is to glance at the hive, without opening it, to see that the bees are working satisfactorily."

In neither of the above papers is there any clear indication as to the kinds of bees that should be selected. Yet there is ground for the belief that the Indian kinds have not yet become accustomed to the Western style of hive, which they are apt to desert all too suddenly, while imported "Spanish" bees have not become sufficiently acclimatised to assure a reliable strain without fresh stock being imported from time to time.

As to this a few planters are probably in a position to furnish really useful information, the outcome of practical experience. Will any of them have the goodness to do so?

In Porto Rico this subject has, as stated above, aroused interest among coffee-planters. Native hives have been used, but some of the bee-keepers are transferring their stock to the standard hive and are raising Italian bees. The climatic conditions are not the same as in the coffee planting districts of South India, nor are the bees. In both countries the production of extracted, rather than comb, honey is recommended; and reasons for this preference given in the Porto Rico bulletin already referred to are as follows:—"The production of extracted honey is not only easier for the bee-keeper, but is much less work for the bees, than is the raising of honey in one pound sections. In making the extracted honey the comb is used over and over again by the bees instead of their having to build new ones each time, as is the case in making the pound sections. When the comb in the supers is filled with honey and well capped it is taken to the extracting house uncapped, and the honey removed by the extractor. The empty

comb is then given back to the bees for them to re-fill with honey, thus saving bees the labour of producing new wax. It is much easier to control the bees when extracted honey is raised, as there is less tendency on their part to swarm. Honey is raised in larger frames and the bees are not forced to so great an extent as in the production of comb-honey made in small sections. Bees will not start to fill the one pound sections until they have filled every available cell in the brood chamber. This cramping of the brood starts the swarming fever ; if they are not watched very little honey is produced in the section boxes and a swarm comes off, lessening the working force of the hive. This is not the case in the production of extracted honey, for, as soon as there is a flow, supers are added, provided the colony is strong and shows a tendency to store."

Honey Plants.

The following are further extracts from the Porto Rico bulletin :—

"*Coffee.*—Coffee is grown over the greater part of the island, the interior being entirely devoted to this one crop. Coffee generally has three blossomings and sometimes four during the year. The flowers last only about a day, but, as all the plants do not blossom at once, the bloom lasts about a week in all. The honey derived from this plant is pure white. Often the coffee bloom comes at the same time as the orange, and the combined nectar of these two plants makes a very delicious honey, the flavour of the orange, however, predominating.

"*Orange.*—There are two blossomings generally in cultivated orange groves, the honey flow lasting about three weeks. This flower produces a white honey and it is classed in trade as 'the honey of the gods.' When there is a heavy flow on, the odour of orange can be noticed around the hives. The honey flow from the wild orange lasts much longer than from the cultivated, the reason being due to the difference in altitude at which they are found. Those in the low lands blossom first while those in the high lands blossom later on, giving the bees a longer working period."

The cocoanut palm is also mentioned as furnishing some honey. Some shade trees (for coffee) and shrubs are also named, but not in such a way as to permit of identification here. The Mango and the Tamarind are in the list.

Experience in this country justifies the addition of the Ceará Rubber tree (*Manihot glaziovii*).

Planters should observe for themselves the habits of the bees on and round about their estates, noting specially the flowers and blossoms worked by these honey and pollen gatherers and makers. In Porto Rico "Bees gather only pollen from some plants as the honey is not within their reach, while in other plants it is just the reverse." There is at least one plant there that furnishes both nectar and pollen.

Closing Remarks.

Note what is said in the last paragraph of the quotation given above from the *Agricultural Journal of India.*

Then, this corresponding extract from the Porto Rico bulletin :—

"Bee books, magazines, and circulars, are of great assistance to the beginner and many valuable points may be obtained from them, but the best teacher is actual experience in handling bees. It is, therefore, advised that those who wish to take up bee culture, commence in a very small way, with from one to four hives, and study the ways and habits of these interesting little insects and learn to handle them intelligently before increasing his stock."

DISTRICT PLANTERS' ASSOCIATIONS.

Shevaroy Planters' Association.

COMMITTEE MEETING.

Proceedings of a Committee Meeting of the Shevaroy Planters' Association held at Victoria Rooms, Yercaud, on Tuesday, 5th December, 1911.

PRESENT.—Messrs. C. G. Lechler, F. D. Short, J. C. Large, Revd.—Rochet, and Chas. Dickins (Honorary Secretary and Chairman).

I. Notice calling the meeting was taken as read.

II. *Complaint against a Village Munsiff.*—Read letter dated 27th September 1911 from Mr. J. C. Cobbe complaining that in consequence of information withheld by the Munsiff of Perria Malany Village, Trichengode Taluk, and a statement by the Deputy Tahsildar, Yercaud, that the defaulter "Kunthen" being employed as a Government Sweeper of that village, he is unable to punish him. Resolved: "That the Honorary Secretary bring the matter to the notice of the Collector and District Magistrate, Salem, for his information and kindly reply as to whether a man being in Government employ is thereby shielded from being punished for cheating."

III. *Estates on the Pulneys.*—Read letter dated 21st October 1911 from Mr. E. F. Barber, and letters dated 5th November 1911 from Messrs. Bell and Pringle-Waldeck, asking if Estates on the Pulneys would be allowed to join this Association. Resolved: "That the Honorary Secretary on behalf of this Committee in extending its hearty welcome desires time to put this matter before the next General Meeting of members of the S. P. A. to be held early in January next, when it has no doubt the joining of Pulney Estates to this Association will be favourably received."

IV. *The U. P. A. S. I. Financial Position.*—Read circular No. 68/11 of 10th November 1911 from Secretary, U. P. A. S. I. Resolved: "That this subject be deferred till the next General Meeting.

V. Read and recorded letter No. 55 dated 7th October 1911 from Chairman, Yercaud Union, also letter No. 515 dated 15th October 1911 from Deputy Tahsildar, Yercaud.

(Signed) CHAS. DICKINS,
Hon. Secy. & Chairman.

Nilgiri Planters' Association.

At a Meeting of the Nilgiri Planters' Association held at Ootacamund on the 4th December 1911, the following members were present:—Mr. E. F. Barber in the chair, Messrs. J. C. Nicholls. J. Harding Pascoe, A. K. W. Downing, A. S. Dandison, L. L. Porter, G. Oakes, A. Wingrave and W. Ward.

HONORARY SECRETARY.

The proceedings of the last meeting, held at Ootacamund on the 29th May 1911, were read and confirmed with the exception that it was suggested that as for many years the Honorary Secretary had been appointed from the Eastern side of the District it would be very advisable that the next Honorary Secretary should be a member from the Western side. It was accordingly proposed by Mr. Barber and seconded by Mr. Oakes, that the thanks of the Association be tendered to Mr. Downing, who had offered to undertake the duties of Honorary Secretary at the last meeting, and that as he was willing that a member from the Western side of the District should be

appointed, Mr. J. S. Nicolls, of Davershola, be asked to act. Mr. Nicolls expressed his willingness to take on the duties of Honorary Secretary as from the 1st January 1912.

NEW MEMBER.

Mr. Wingrave was proposed by Mr. Dandison and seconded by Mr. Oakes as a member of the Association.

U. P. A. S. I., DELEGATES' REPORT.

The following is the report of the delegates to the U. P. A. S. I.

"With very full reports of the U. P. A. S. I. meeting published in the papers, it is hardly necessary for us to make a loug report. Of necessity much of the work got through is done in Committee, and to a very great extent this will be published in the book of proceedings.

There are a few points we would liks to touch on.

SCIENTIFIC OFFICER'S ASSISTANCE.—The Mysore Association have taken practical steps to procure this. At one of our meetings it was unanimously carried that we should do the same, but as a subsequent meeting did not confirm this we had no definite instructions from you. We think the matter should be kept to the fore, and that we should be ready to act if the Mysore experiment proves a success. The Shevaroys are anxious to join us in the matter, but they are unable to bring a very large acreage to subscribe, and we would point out that if many members of our Association hold aloof, the cost to those subscribing will come to more than the 8 annas per acre estimated to cover everything. The late Mr. Tipping's estimate was based on the assumption of everyone joining.

We leave this matter for the present, as we hope it will come up for further discussion in the course of this meeting.

FINANCE.—This matter gave cause for lengthy discussion in Committee, and eventually the South Travancore Association proposed the following resolution:—

"That in view of the Association's Financial position the Secretary be asked to circularize Honorary Secretaries, pointing out the urgent need for funds in order to enable the work of the U. P. A. S. I. to be carried on properly, and requesting those districts that are able to do so, and have not joined the Scientific Officer Assistant fund, to pay a subscription at 2 annas per acre to cover all expenses."—Carried.

Owing chiefly to the Scientific Officer Department the work of the general office has increased and more money will have to be subscribed if the parent Association is not to be run at a loss. We think that this matter should be considered in precedence of the Scientific Officer Assistant scheme, and not at present in conjunction with it. We ought to make sure of what we have got before we take up anything new. We would point out that the resolution as it stands will not affect us at once, but when the 5 years for which Scientific Officer subscriptions were guaranteed are over, we shall have to start on some new basis, if we are to accord the same support to the U. P. A. S. I. as we are giving now.

GREEN TEA.—As instructed we opposed the bonus on green tea. No doubt other Associations look on us as wreckers, but we opposed it in no wrecking spirit; the amendment we proposed we consider fair, and one that might have received consideration in Calcutta. After all we are dealing with quasi-public money collected among ourselves by a tax. The U. P. A. have a small voice in the matter of how this money should be spent, and we should be careful to use that voice with due regard to the best benefit of all.

LABOUR.—With the door closed to the discussion of Act I of 1903, and as the registration scheme, as proposed by the Anamalai Association, did not meet with very general approval, nothing definite was settled about this matter, which is of the greatest importance to us all, and we are sure the position will not improve of *itself*, as time goes on. Mr. Martin (as you know) has started a scheme for distributing pamphlets amongst the Villages in the various recruiting districts which we strongly advise be given a good trial and see what it will do to combat our chief competitor—overseas emigration.

WARRANTS.—This matter of interest to us received full discussion. The opinion of the meeting was that the warrants should be given to Maistries and not to the Police, and the suggestion of the D. S. P., Nilgiris, that a register of all warrants issued should be kept, was adopted. Of course this raises the question whether the police can keep a register, if they do not handle the warrants.

SECTIONAL MEETINGS.—The following amendment to the original resolution was put and carried (*vide P. C.* Vol. vi. 36, P. 556.) We voted for this as we think it will help to unite and foster the work between the parent and District Associations and also when the Annual Meeting of the U. P. A., S. I. falls due, there will be more time to discuss matters which are of importance to Districts in general, and the more purely local matters might be settled at these Sectional Meetings, for it was the opinion of all at Bangalore that the agenda is becoming too lengthy for every item to be gone into really thoroughly in the few days the meeting lasts.

Any point we may have omitted to mention or any matters members may require information on, we shall (if possible) be glad to answer to the best of our ability."

Mr. Harding Pascoe proposed and Mr. Porter seconded, that the report be adopted and that a vote of thanks be given to Messrs. Downing, Dandison and Barber, the delegates representing the Association.

U. P. A. S. I. FINANCE.

Read letter from Chairman, U. P. A. S. I., quoting resolution passed at the U. P. A. S. I. meeting, with three statements—" A." giving present estimated annual income and disbursements for 1911-12, showing a very considerable deficit of Rs.1,620 which will have to be met out of the reserve fund; "B" —Estimated receipts and disbursements, should Associations agree to the inclusive annual subscription of 2 annas an acre, as suggested in the above resolution, and "C" statements showing which Associations at present contribute less than 2 annas an acre. As pointed out in the delegates' reports, the resolution would not at present affect the Nilgiri District. It is very clearly shown in the Chairman's letter to how great an extent in the last few years the work of the U. P. A. S. I. has been increased, entailing, of course, proportionately greater expenditure.

It was resolved that a committee be formed with a view to circularising members as to the financial position of the U. P. A. S. I., and to draw up a scheme to give effect to the resolution passed in this connection at the last U. P. A. S. I. meeting. Mr. Porter and Mr. Downing were asked to act as a Committee, with power to add to their number.

SECTIONAL MEETING.

It was resolved that the Honorary Secretary be asked to arrange with the Honorary Secretary of the Wynaad Planters' Association for a sectional meeting to be held at some convenient time and place. It was suggested that some time in February would be convenient and that members from

the Anamalais and the Shevaroys should be invited to attend. It was also suggested that Calicut or Coimbatore would be a convenient centre.

ASSISTANT SCIENTIFIC OFFICER.

The Shevaroys having expressed their willingness to co-operate in subscribing to an Assistant Sc. O. Fund, it was resolved that the Honorary Secretary of the Sheveroy Association to enquire what the minimum subscription of that Associatlon to the extra Scientific Officer fund at eight annas per acre would be and to circularise members of the Nilgiri Planters' Association as to how many would be prepared to join, now that they had the delegates' report before them.

LABOUR CIRCULARS.

The meeting resolved that the Honorary Secretary be requested to write to the Central Association and order five thousand Labour Circulars, 2,000 in Canarese, 2.000 in Tamil and 1,000 in Telugu.

NON-SERVICE OF WARRANTS.

Recorded the resolution passed at the recent U. P. A. S. I. meeting.

SCIENTIFIC OFFICER'S TOUR.

The meeting recorded the U. P. A. S. I. resolution to the effect that six weeks' notice should be given in the event of an Association requiring the services of Mr. Anstead. It was resolved that the attention of members be drawn to this resolution.

HYBRIDISATION OF COFFEE.

Recorded resolution of the U. P. A. S. I. showing that the Nilgiri District contributes Rs.100 to the cost of the experimental plot.

It is understood that orders have been issued by the Government of Madras that the plot be started and that clearing has already been commenced.

PLANTERS' BENEVOLENT FUND.

It was pointed out that the subscriptions to this fund amounted to only Rs.105, and the Honorary Secretary was requested to invite planters to support this very excellent scheme.

MALABAR TENANTS' IMPROVEMENT ACT.

Resolved to print and circulate the letter from the Collector of the Nilgiris in this connection to all members interested.

LABOUR CONTRACTS.

Read correspondence between Mr. Nicolls and the Gudalur Magistrate in the case of Pongay Maistry. Mr. Nicholls asked to have the accused, who had been convicted under Section 35, ordered to fulfil his contract on the expiry of his sentence. The Magistrate declined to do this, on the ground that the period of Pongay's contract, which was from May 15th 1910 to March 14th 1911, had expired. He considered that Mr. Nicolls' only remedy was under Section 23, *i.e.*, that the Maistry could be ordered to repay the amount of his advance "within a reasonable time" or have his moveable property seized. According to this ruling, if a defaulting Maistry can avoid arrest till the period of his contract has expired, his employer has no remedy except under Section 23.

The Meeting was of opinion that the Magistrate was wrong.

In reply to letters from Mr. Nicolls and from the Honorary Secretary, N. P. A., drawing the District Magistrate's attention to the case, the following order was made by the District Magistrate.

"This is a judicial matter and should be treated judicially and not by letter. The Magistrate must make an order as a Magistrate, then the matter can go before the District Magistrate judicially in the event of an appeal. The District Magistrate cannot accept a mere letter of reference from Mr. Nicolls, still less from the Secretary, Nilgiri Planters' Association, who is not a party to the proceeding; neither is the District Magistrate the legal adviser of the Sub-Magistrate. If there was any *order* and if an appeal was filed, then the District Magistrate will deal with it and not until then."

The Meeting passed the following resolution:—"This Association expresses regret not only that the order of the District Magistrate is expressed in such terms but also that the order was so delayed as to prevent Mr. Nicolls appealing within due date."

RAILWAY FREIGHT.

With reference to the statistics obtained by the Honorary Secretary with a view to obtaining concessions for planters' produce and manure carried by the S. I. Railway, the meeting passed a resolution approving of the Honorary Secretary's action and trusting that efforts will be made to obtain further statistics.

KIDNAPPING.*

Read correspondence relative to the kidnapping of a young cooly named Puchai, who was employed under Mr. Porter. The correspondence went to show that this lad when on his way from Mr. Porter's Estate to Ootacamund was drugged and taken to Ceylon, it is supposed by labour recruiters. The meeting resolved that the Secretary of the U. P. A. S. I. be requested to address the Ceylon Labour Commissioner on the matter.

MR. TRAVERS PHILLIPS.

Read letter from Mr. Travers Phillips thanking the Association and individual members for the assistance given to him and his Police whilst serving as D. S. P., Nilgiris. The Association recorded their appreciation of the letter and Mr. Phillip's services to the planting community.

BEHAR PLANTERS' APPEAL.

A letter from the Behar Planters' Association enclosing copy of a memorial to Government with reference to the "Weston and Clarke" cases was read and a resolution passed to the effect that the meeting support the memorial to Government.

A vote of thanks was proposed and carried to the O. C. Nilgiri Volunteers for use of the Armoury.

(Signed) L. L. PORTER,
Hony. Secy., N. P. A.

NOTE.—* Since the date of the meeting, at the instigation of the District Magistrate, Nilgiris, the Ceylon Labour Commissioner has written for particulars of the boy Putchai and has promised to do his best to trace him. The Police are also enquiring into the matter.

Angola exports only wild-grown coffee of the commonest Bahia sorts. With the exception of half-a-dozen properties in the district of Loanda, which are under European administration and grow some of the Arabian and Liberian kinds, all the coffee comes from groves owned by natives at a distance of some 200 miles from the coast. The better qualities of plantation coffee—of which, however, only a small amount is placed on the Loanda market—are locally consumed.

CORRESPONDENCE.

New York Rubber Exposition.

Dear Sir,—May I suggest that you do not, to use an Americanism, turn this letter down, but kindly give the above-named Exhibition all the support you can, as it will eventually prove to have been of the greatest benefit to you. America, if looked after, will, in the near future, be one of your best markets, and as the Manufacturers are on the turning-point in favour of plantation rubber, the trade will be yours for the asking.

During my recent visit to the United States I made exhaustive enquiries, and it only requires the quality of the various grades, and the possibility of the supply, to be clearly put before the users.

I have been told that the Americans know all about plantation rubber, but this is not so; very few of the Manufacturers have had an opportunity of studying the subject to any great extent in their own country.

They are all interested in this Exposition, and, while South American countries will be exhibiting largely, the PLANTATIONS should come forward with a bold front. If they do, I know they will not regret having taken my advice, for, as you are aware, the States not only use one half of the crude rubber produced, but manufacture more than half of the world's supply of rubber goods.

(Signed) A. STAINES MANDERS,
Organising Manager.

London, 17th Nov. 1911.

PLANTATION RUBBER.

"In connection with the NEW YORK EXHIBITION, it strikes us that there may possibly be a certain amount of reluctance among planters to exhibit again so soon after the London Rubber Exhibition. However, Plantation rubber is a commodity that is just making its way, and it behoves all to do everything they can to push it among the manufacturers, especially in America, where it is not yet thoroughly understood—as where is it?—and where there undoubtedly exists the greatest potential demand. A long time may pass before a similar opportunity offers. ONE THING MUST BE EMPHASISED—IT IS NECESSARY TO ERADICATE THE FALSE IMPRESSION THAT STILL EXISTS IN SOME QUARTERS THAT THE EXTENDED USE OF PLANTATION RUBBER IS JUST A PLEASANT DREAM OF THE FUTURE, A POSSIBILITY AND NOT AN ACTUALITY. This (as those who read this paper, and who have studied, for example, our market correspondent's remarks last week, know) is wrong. Plantation rubber last year passed into consumption while Pará sorts were piling up in the ports; it is rapidly encroaching upon the once undisputed field of Fine Hard Pará, and bids fair before long to be in even greater supply than is the present standard grade. It is harvested throughout the year, admitting no periods of scarcity; is sold in public auction, or can be contracted for in advance, and it has never been threatened that it will be the subject of valorisation proposals. In fact, in the expressive American phrase, which can be used here with special appropriateness, Plantation rubber is IT. "THESE, THEN, ARE THE FACTS THAT SHOULD BE MADE WIDELY KNOWN TO THE AMERICAN MANUFACTURER BY PRECEPT AND, IF POSSIBLE, BY DEMONSTRATION. Brazilian interests will certainly be well represented, and judgment, as we all know, is usually given against the party which does not enter an appearance." —*India-Rubber Journal.*

PLANT DISEASES AND PESTS.

Legislation Against Insect Pests and Plant Diseases.

Commenting upon the proposed legislation in the United States to which attention has been called in these pages, *Nature* remarks:—"The effort to secure national legislation to keep out new and dangerous insect pests or plant diseases which may be brought in with imported nursery stock has been actively favoured by the U. S. Department of Agriculture, just as the department in the past has promoted and secured legislation enabling it to exclude from the country diseased animals or to quarantine and stamp out animal diseases whenever such have appeared. In the case of domestic animals, the exercise of these powers has brought enormous benefit, and has worked entirely satisfactorily to the livestock industry. It is reasonable to believe that like benefits to fruit and forest interests, including the nursery business, will undoubtedly come from similar legislation to exclude insect pests and plant diseases.

"The immediate danger which led to the recent effort to secure legislation was the discovery in 1909 of the abundant importation and wide distribution into the United States of nursery stock infested with brown-tail moth nests and occasional egg masses of the gipsy moth. During the years 1909 and 1910 such infested stock was carried into twenty-two States, covering the country from the Atlantic seaboard to the Rocky Mountains. During the first of these years no fewer than 7,000 winter nests of the brown-tail moth, containing approximately 3,000,000 larvae, were found in shipments into New York State alone—seed material enough to infest the whole United States within a few years. During the second of these years 617 of these nests were found on nursery stock shipped into the State of Ohio, and a much larger number, approximately the same as the year previous, were again sent into New York. Smaller numbers of these nests, proportioned to the amount of nursery stock received, were sent into other States east of the Rocky Mountains during both these years. Fewer brown-tail moth nests were received during the season just ended (1910-11), owing to the agitation in this country and more strict supervision by foreign Governments.

"So far as possible, this stock, as voluntarily reported by customs officers and railroads, has been examined and the brown-tail nests removed or destroyed by State authorities, or, where these were not available, by agents of the Bureau of Entomology of the United States Department of Agriculture. Undoubtedly many shipments have not been reported or examined, and it is quite probable that local infestation has already started at different interior points. The history of both the gipsy and brown-tail moths in New England shows that these insects may be present for several years without being noticed, slowly gain headway, and then suddenly develop their full power of destructiveness.

"It is scarcely necessary to comment on the danger from the careless introduction and wide distribution of these two orchard and forest pests. In a limited district in New England more than a million dollars a year have been spent for a long period in a mere effort to control these two insects, and the General Government is now appropriating three hundred thousand dollars annually to endeavour to clear them from the border of main highways and thus check their spread. These expenditures do not take into account the actual damage done, but they do serve as a measure of the danger to the whole country from the recent distribution of these two insects on imported nursery stock.

"As further illustrations of the constant risk from lack of legislation may be mentioned two very recently introduced insects which will undoub-

tedly prove very expensive pests in future years. The European alfalfa leaf-weevil, on the authority of the entomologist of the Utah Experiment Station, Mr. Titus, was probably brought into Utah on packing of nursery stock or other merchandise from Europe. This leaf-weevil has already destroyed much of the value of the important alfalfa crop of Utah, and is spreading into adjacent States. The other illustration is the Oriental cotton scale (*Pulvinaria psidii*), probably the worst scale pest of citrus and other subtropical plants in southern Asia. This scale insect has recently been introduced into Florida on imported stock, and is already well established there.

"New plant diseases, against the entrance of which there is at present no bar, may even more seriously jeopardise the farm, orchard, and forest products of this country. Imported potatoes from Newfoundland are now bringing in the potato wart disease, which, wherever it has been introduced in Europe, and also in Newfoundland, puts a stop to potato culture. The importation of white-pine seedlings is now bringing in the European white-pine blister rust, which, if established and disseminated, will destroy much of the value of our white-pine forests. Absolute quarantine against these two plant diseases is the only means of keeping them out. The chestnut disease, now practically shown to have been introduced on trees imported from Japan, illustrates what may quickly happen from such unchecked introductions.

"More than half of the important insect enemies and plant diseases now established in the United States have been brought in on imported nursery stock, and new insect enemies and new diseases are being thus introduced every year. Twenty different insect pests, new to the United States, some of them very formidable in the Old World, have been intercepted in the inspections of the imported material by this department this year, and this does not include the introduction of brown-tail moth nests and other European pests with imported seedling stock.

"A properly enforced quarantine and inspection law in the past would have excluded many, if not most, of the foreign insect enemies and plant diseases which are now levying an enormous annual tax, amounting to several hundred million dollars, on the products of the farms and orchards of the United States.

"In spite of the many pests which have already gained foothold, and the control of which will be a permanent annual charge on production, there remain many other insect pests and plant diseases with equal capacity for harm which, fortunately, have not yet come in; and it is to protect from these new dangers that legislation is now sought, not with the intention of prohibiting the trade in imported stock, but to throw such safeguards around it as will most protect both the importers and the subsequent purchasers of such stock.

"The insect pests and plant diseases that have come in are probably here for all time, but certainly no reasonable objection can be made to the effort to safeguard the future. The conscientious importer will be benefited, and the home producers, the dealers, and all the great fruit and forest interests will be protected by suitable inspection and quarantine legislation. . . . . .

"In the measure now before Congress, inspection of imported nursery stock is left to the different States instead of being undertaken by the Federal Government. A complete system of notification is provided for, however, both through the requirement of a permit and by subsequent advices to be given by the customs offices, the broker or first receiver of the stock, and the common carrier transporting it."

RUBBER.

Yields from young and old Trees.

Hitherto it has been impossible to give anything like an adequate survey of the yields likely to be obtained from Hevea trees under cultivation in the middle East. Now, however, we have detailed information regarding results obtained during the last six years from trees ranging in age from $2\frac{3}{4}$ to 25 years of age, growing under very dissimilar conditions and tapped on systems remarkable for their variability in principles. We now possess records of yields from exceptionally young and old trees, from trees with a difference of twenty years in age, from individual estates, and lastly from the whole of the tapped trees in the peninsula during specified years.

YIELDS FROM YOUNG TREES IN MALAYA.

The yields obtained during the last five years in Malay have been largely responsible for stimulating interest, agriculturally and financially, in the rubber planting industry. There are now about a hundred London companies producing rubber in Malaya alone, and the yields obtained over large acreages as well as from notable trees have so far given every satisfaction.

The yield from very young trees is by no means insignificant. An experiment was made in Selangor during 1909 with 2,845 trees which were only $2\frac{3}{4}$ years old; these were tapped for two months and gave an average yield of 0·297 lb. per tree. Tapping for only eight months 2,843 trees, $3\frac{1}{2}$ years old, gave 1·24 lb. per tree, and in nine months 6,426 trees $3\frac{3}{4}$ years old gave 1·06 lb. per tree.

Another record shows that 6,444 trees $4\frac{3}{4}$ years old gave, in two months, 0·178 lb. per tree, and 4,420 trees, $5\frac{3}{4}$ years old, for the same period yielded 0·248 lb, of rubber. In another field, 400 trees $4\frac{3}{4}$ years old, tapped for six months gave 1·107 lb. per tree, and 4,674 trees, $5\frac{3}{4}$ years old during the same period returned an average of 0·961 lb. per tree.

A large number of trees, all $5\frac{3}{4}$ years old, were tapped during 1909 for two, four and six months, and yielded respectively 0·248, 0·503 and 0·997 lb. per tree, or an increase of approximately 50 per cent. for each two months' tapping. . . .

Excellent results have been obtained on Malay estates by cutting a large V or Y at a foot to eighteen inches from the base of the tree, the V extending half round the tree; when the tree is large enough a second V is cut on the reverse side. By such a method the young trees can be tapped regularly—almost every alternate day—the rubber is extracted only from the thick part of the bark, and a high yield is obtained from the basal regions.

FROM OLD TREES.

In marked contrast with the above are the unexpected high yields obtained, in twelve months, from individual trees on various properties. On Jugra estate we are informed that seven to nine years old trees gave seven lb. per tree, and on Cicely eight-year-old trees gave 8 lb. The Federated Malay States Company possess over 2,900 $9\frac{1}{2}$ year-old trees which gave 24,000 lb. of rubber in one year, or on average per tree of 8·2 lb. Twelve-year-old trees on Linggi yielded 10·7 lb. in twelve months, Batu Unjor is reported to have secured 10·73 lb. per tree from 6,800 trees at the age of from 11 to 12 years. A yield of $28\frac{1}{2}$ lb. is also recorded from the 17-year-old trees growing near the churchyard at Parit Buntar. Similarly high yields, equal to one pound of rubber for each year's growth, have been published from time to time, but it is extremely doubtful whether such

yields can be relied upon annually. In several instances the trees have been growing under exceptionally favourable conditions, and many do not appear to have been tapped until they attained quite an advanced age.

Yields in Ceylon.

It is quite manifest from a comparison of the figures available in this office that, up to the present, Ceylon takes a second place compared with Malaya, in point of annual yield from young trees and from definite acreages of known age. It so happens that the yields from old trees in Ceylon are exceptionally high. It is, nevertheless, clear that the soil or climatic conditions in Ceylon are less favourable, in the first few years, to the growth of *Hevea brasiliensis*. Whether the moist conditions in Malaya will prove to be as beneficial to old trees as the dry environment in Ceylon remains to be proved. It must be pointed out that, though the rubber in Ceylon may only have been produced at the rate of 130 lb. per acre, per annum, other products on the same land have returned good crops during the same period.

From Young Trees.

There are very few, if any, estates in Ceylon where the trees are sufficiently large to permit of tapping under four years of age. In this respect there is a striking difference with Malaya, where tapping is often started as soon as the trees are three years old. Purely as an experiment some two-years-old trees were tapped in Kalutura, but the yield therefrom was insignificant. In this district quite a number of trees, tapped when four years old, have given over 100 lb. per acre in the first twelve months. A yield of ½ lb. per tree is recorded from 2,119 trees, four years old, on one estate, and of 0·63 lb. per tree from 747 trees of the same age on Mahawale. On Rayigam, 6,000 trees, four to five years old gave ½ lb. of rubber each, and a turther 1,500 yielded 0·41 lb. each. Light tapping of young trees on well-known Kalutura property gave 1·72 lb. of rubber per tree.

From old Trees.

At one time a yield of two to three lb. per tree from eight to eleven-year-old trees on Kepitigalla estate was considered good. One tree on Elpitiya, 46 inches in circumference and eleven years old, gave 16 lb. of rubber when tapped on the spiral system. The Elpitiya tree had a circumference of 46 inches; the tapping was commenced in October, 1904; the tree was rested in November, tapped again in December, rested in January, 1905, and continuously tapped from February to June, 1905. Tapping was re-commenced in September, 1905. This tree appeared quite healthy in April, 1908.

Individual trees of unknown age (probably 20 to 25 years) on Culloden estate, gave 10, 18, 23, and 25 lb. of rubber in twelve months, tapped on various systems. These trees gave an average of 18 lb. per tree, per annum, for four years.

Several trees at Peradeniya, when 29 years old, gave 6¾ lb. each in eight months, and were still in good condition. Others on the same site gave three lb. each in twelve weeks. . . .

The largest yield appears to have been obtained from the old Heneratgoda trees during 1909 and 1910. During that period the largest tree gave 160 lb., or at the rate of 80 lb. per annum. This, from a tree planted in 1876, gives one some idea of what yield can be obtained from Hevea on very poor soil at thirty-five years of age. It is only fair to add that the trees at Heneratgoda have never been systematically tapped and were not until a few years ago even experimentally operated upon.—*India-Rubber Journal.*

The Planters' Chronicle.

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(INCORPORATED.)

Scientific Assistant Scheme.

At a meeting of the Committee of the Coorg Planters' Association held on December 5, 1911, it was decided that a Scientific Assistant should be engaged to work in that province. The Coorg Association has a guarantee of 12 annas per acre on 13,000 acres.

The matter has been laid before the Council of the U. P. A. S. I. for consideration.

Labour Problems.

The Ceylon Labour Commissioner, Trichinopoly, writes with reference to resolutions adopted at the last annual meeting of the U. P. A. S. I.:—

"I have always endeavoured to avoid causing Indian Planters any inconveniences and am prepared at any time to consider any proposals that would tend to prevent a clashing of the interests of Ceylon and South Indian Planters, as it is our hope that the relation between the South Indian Planters and ourselves should always be of an amicable nature.

"With reference to the concluding paragraph of the Resolution quoted in your letter I shall be glad to receive details of any specific cases of crimping, without which I can do nothing. May I suggest that the Estates enrolled in your Association be advised that if they will immediately communicate with me direct regarding any case of alleged crimping by Ceylon Kanganies, I shall be only too pleased to render them any assistance possible?"

London Tea Auctions.

A conference was held lately between representatives of the Indian Tea Association, London, and the Buyers' and Brokers' Associations. The Indian Tea Association's representatives had reported to the Committee that they were not in favour of the proposal that bidding in eighths should be introduced. The London Committee had eventually adopted a resolution to this effect: the resolution stated that while not prepared to agree to an alteration to the extent suggested, the Committee were willing to have a trial given to their former resolution with regard to double line lots. The resolution referred to was in the following terms:—"Where one bulk is divided the buyer's bid of say 7*d*. and drop to be accepted as a bid for both lots, and no one else shall have the right to cut him out on the second or drop bid. Any one, however, may secure the tea by bidding 7*d*. or higher for both lines. The new arrangement would only apply to teas selling up to a limit of 8½*d*. per lb." The Buyers' Association in London had been addressed in this sense.

Scientific Officer's Papers.

LXXXIV.—Fertiliser Values.

In *Experiment Station Work* LXV published by the U. S. Department of Agriculture as *Farmers' Bulletin* 465 the following very interesting article occurs dealing with the cost of available Nitrogen :—

" E. B. Voorhees shows in a Bulletin of the New Jersey Experiment Station that 40 per cent. of the total amount annually expended for fertilisers in that State is paid for nitrogen, and this is probably typical for all regions where fertilisers are generally used. Moreover, nitrogen is the only one of the three essential elements of plant food likely to suffer any considerable loss in use, not more than 70 per cent. of the nitrogen applied in the best forms being recovered in crops. There are no such losses of phosphoric acid and potash.

" From the standpoint of crop it is evident that the utilization of nitrogen is a much more important matter than the use of phosphoric acid and potash, although the further fact that a pound of nitrogen, capable of being used in a commercial fertiliser, and without regard to form, costs from four to five times as much as a pound of " available" phosphoric acid or of potash, is an additional argument in favour of greater care in its purchase and use.

" Nitrogen as nitrate is the only commercial form soluble in water, ready for immediate use, by most plants. Nitrogen as ammonia is also a form soluble in water, but it is less available than the nitrate. A pound of nitrate and a pound of ammonia, being definite chemical compounds, are quite as good from one source as another.

" Organic forms of nitrogen have to decay first, changing to ammonia and then to nitrate, and are therefore less quickly available ; besides, they vary in their rate of availability according to the source of supply and their physical character. Materials which are likely to decay quickly, as dried blood, dried meat, dried fish, and cotton-seed meal, do show a high rate of availability. A pound of organic nitrogen varies in availability, therefore, according to its source, whether derived from dried blood, or peat, or from immediate products.

" Since nitrogenous materials are variable in their rate of availability —that is, the rate at which the nitrogen in them may be absorbed by the plant—the farmer desires to know the dependence that can be placed on the different materials. He wants available nitrogen. Hence, the chemical and physical characteristics of the various forms of nitrogen have been made the subject of very considerable study and investigation, in order that at least approximate values in respect to availability may be attached to each form. Sufficient work has been done thus far to establish a pretty safe relationship between the nitrate, ammonia, and organic nitrogen, in the form of dried blood.

" Commercial conditions fix the price of the various nitrogenous materials, and the cost to the farmer of any one form is not measured by its usefulness to him, but by the cost in the market. That is, there is no strict relationship between commercial and agricultural values.

" It happens that at the present time a pound of nitrogen in the form of nitrate, or of ammonia, costs the farmer less than a pound of organic nitrogen ; that is, the nitrogen possessing the highest rate of availability as nitrate is less expensive to him than dried blood nitrogen, or even that derived from low-grade nitrogenous materials, which do not possess any definite rate and which must, on the average, show a much lower rate of availability than dried blood, because the mixtures contain nitrogen derived from many sources, not uniform in their content of nitrogen or in their physical character or constitution.

"The experiment station has since its establishment consistently urged the farmers, in their purchase of fertilisers, to be guided not only by the quantities of the constituents present in the mixture offered, but also by the kind that is used in them, pointing out the importance of selecting brands which contain high percentages of available plant food, more especially of nitrogen, because of its relatively greater importance or its higher cost.

"The Station does not discourage, but strongly encourages, the use of waste products containing nitrogen, but it insists that—

"The cost to the farmer of a pound of nitrogen in the materials, of a value lower and more variable than the nitrate and ammonia, should be lower rather than higher than for nitrate or ammonia.

"It is not economy to save refuse nitrogenous materials if the cost of the nitrogen to the farmer is greater and his returns less than may be obtained by the use of nitrogen from materials of known value. Farmers have been and are now spending thousands of dollars for nitrogen for which they do not receive a proportionate return.

"To the farmer it is purely a business proposition. He buys nitrogen in order that he may get a return in crop. If in one case 100 pounds of nitrogen contributes 60 pounds to the crops upon which it is applied and in another 100 pounds contributes but 40 pounds to the crops, the purchaser should not pay the same for the second as for the first, for if he did so he would pay 50 per cent. more per pound for his "available" nitrogen. That is, if the cost of the first hundred pounds were $15, the second hundred should cost but $10 when the basis of value is the amount available in each."

It may be of interest at this point to examine the cost of Nitrogen to planters in this country, and in the following table the cost per unit of Nitrate Nitrogen, which is the form in which it is most readily available to plants and so the most valuable, and of organic Nitrogen, have been worked out from the price-list of a leading firm dealing in fertilisers :—

Fertilizer.	Cost per ton.	Percentage of nitrogen.	Value per unit. Nitrate Nitrogen.	Ammoniacal Nitrogen	Organic Nitrogen.
	Rs.		Rs. A. P.	Rs. A. P.	Rs. A. P.
Nitrate of Soda ...	230	16	14 6 0		
Nitrate of Lime ...	170	13	13 1 3		
Nitrolim ...	200	18	11 1 9		
Sulphate of Ammonia	250	21	...	11 14 5	
Ground Nut Poonac	90	8	...	...	11 4 0
White Castor „	75	6	...	...	12 8 0
Black Castor „	60	5	...	...	12 0 0
Neem Poonac ...	60	5	...	...	12 0 0
Hoongy Poonac ...	48	4	...	...	12 0 0

A study of this table bears out the fact that it is most economical to buy high grade fertilizers, a point insisted on over and over again by the U. S. Department of Agriculture, as will be seen presently. Thus the cheapest Poonac when judged from the standpoint of the cost per unit of Nitrogen, which is the correct way of judging the price of a nitrogenous fertilizer, is Ground Nut Poonac.

The following extracts are taken from an article discussing the value of low grade fertilisers, which appeared in *Experiment Station Work LXIV.*

"The old adage 'never buy a thing simply because it is cheap; it will be dear to you in the end' applies with special force in the purchase of fertilizers. Not one thing has been more clearly demonstrated by the work of the Experiment Stations than that it does not pay to buy low-priced, low-grade fertilizers. The low-grade fertilizers, though cheaper as measured by price per ton, are more expensive when measured by the actual amount and quality of plant food which they contain and by the cost of handling. B. E. Rose, from a comparison of the composition and cost of fertilizers on sale in Florida, shows that "the high-grade fertilizers for but little more than a third advance in price over the cost of the low-class goods furnish two-thirds more plant food and five-sixths more commercial value."

"The purchase of the so-called cheap or low-grade fertilizers is certainly never advisable. The cheapness of these mixtures is only apparent. It is not the price per ton of the fertilizer, but the price per pound of the plant food in it which should be subjected to inquiry by the merchant or farmer who is ready to buy.

"A low-grade fertilizer can be sold by the retailer at a low price per ton, but no saving is effected when the price per pound of its valuable ingredients is considered."

Appended is a table showing the cost per unit of Phosphate and Potash compiled from the same sources as the former table :—

Fertiliser.	Cost per ton.	Percentage of		Value per unit	
		Phosphate.	Potash.	Phosphate.	Potash.
	Rs.			Rs. A. P.	Rs. A. P.
Basic Slag ...	70	20	...	6 8 0	
Superphosphate ...	100	24	...	4 3 0	
Flour Phosphate ...	45	27	...	1 11 0	
Muriate of Potash ...	180	...	52	...	3 5 0
Sulphate of Potash ...	200	...	50	...	4 0 0

In the case of Phosphates, solubility must be taken into account. Soluble phosphate is of more value than insoluble, because it is immediately available, and thus Superphosphate containing say 16% soluble phosphate is more valuable per unit than Flour Phosphate containing only a little soluble phosphate, if immediately available phosphate is needed. This must influence the choice of a phosphatic fertiliser as well as the price per unit.

In all cases the cost of transport from the coast has been neglected. This differs enormously in different districts. As far as I have been able to ascertain it may vary from as much as Rs.20 per ton in districts like the Anamalais to Rs.8 per ton in the Wynaad, while the average appears to be about Rs.18-8-0 per ton.

This emphasises the chief point which I wish to make, namely that where cost of transport is heavy, high grade fertilisers are the most economical. As Mr. Haskins of Massachusetts says :—

"The object in buying a fertiliser should be to get the largest amount of plant food in the proper form and proportion for the least money. The high-grade goods approach as near this ideal as is possible in case of factory mixed fertilisers. It costs just as much to freight, cart, and handle the low-grade fertilisers as it does the high-grade. Nitrogen and Potash in low-grade fertilisers cost from a third to a half more than if obtained from high-grade goods. The farmer cannot afford to buy low-grade fertilisers."

RUDOLPH D. ANSTEAD,
Planting Expert.

Notes and Comments by the Scientific Officer.

143. *Lime for Tea Soils.*—I have constantly recommended the application of Lime to South Indian Soils and pointed out the benefits likely to be obtained from such applications. There has, however, been a popular belief that Lime was not beneficial when applied to Tea, though upon what grounds this belief is founded I have been unable to discover. Recently Dr. Hope, the Scientific Officer of the Indian Tea Association, has recommended the liming of Tea soils in Assam, and at a Meeting of the Assam Branch of the Indian Tea Association held on 30th November last he said :—

"The regular use of lime has been a recognised part of the routine of agriculture in Europe for very many years, and in spite of opinions to the contrary, I am convinced that it could be used with good results on many types of tea soil. The experiments made at Heeleaka on the use of lime as a tea manure did not indicate that it was of any value on that particular soil, which is light and sandy and contains only a small amount of organic matter, the least likely type of soil to respond to lime. It is only since experiments with lime have been started in many different parts of the tea districts and we have been able to collect information derived from these experiments that it has become apparent to us that lime can undoubtedly be used with good results in a large number of cases. Lime is a necessary ingredient of plant food, but it is not found in any great quantity in plants generally. The amount of lime in most of the tea soils of north-east India is noticeably small, being anything from a tenth to a hundredth of that found in a good English arable soil. This is the direct result of the heavy rainfall which we experience here, which washes lime, magnesia, potash, sulphates, chlorides, and other soluble substances out of the soil, leaving the surface soils of this part of India usually poor in these substances. Even the small amount of lime which these soils do possess, however, would be more than sufficient if lime were required merely as a food substance. There are several other functions of lime however which are of supreme importance, and for the satisfactory performance of these functions lime should be present in considerable quantities and in the form of carbonate such as results when slacked lime is applied to the soil. In the first place presence of lime is necessary in order to correct the tendency possessed by most soils to become acid as the result of the normal changes produced by the soil bacteria. Soils possessing a large amount of organic matter, and soils which have been repeatedly manured with organic manures possess this tendency to become acid and in many cases would probably be benefitted by lime. Secondly lime has a wonderful effect in improving the tilth of heavy and clayey soils. This effect takes place slowly and will not be noticed at once after using lime, but will be none the less sure. The effect is brought about by the collecting together of the finer particles of the soil into aggregates which produces in effect a soil of coarser texture through which water can more readily percolate, which is better aerated, and which permits more readily of satisfactory root development. To mention one more use of lime, it has been determined that many of the North East Indian Tea Soils possess a considerable amount of magnesia, and in some cases the amount is so great that it is harmful to the health of the bushes. When the amount of lime in the soil is small this harmful effect is more noticeable, and it therefore seems that it could be corrected entirely by the use of a sufficient amount of lime."

RUDOLPH D. ANSTEAD,
Planting Expert.

CORRESPONDENCE.

Rubber -An Inquiry.

Sir,—I shall be very greatly obliged if any of your readers will state what is the oldest rubber clearing that has *regularly* and systematically been tapped for a number of years (say not less than ten) and the condition of the trees at present? Have they been regularly cultivated? I am not asking the questions out of mere curiosity, but in order to help me in a very important matter that I am trying to work out.

QUERY.

Second International Congress of Entomology.

Dear Sir,—Will you kindly give publicity in your pages to the enclosed announcement regarding the Second International Congress of Entomology?

Pusa, 14th Dec. 1911. (Sd.) T. BAINBRIGGE FLETCHER.

Offg. Imperial Entomologist.

[ANNOUNCEMENT].

The Second International Congress of Entomology will be held at Oxford from August 5th to 10th, 1912. Further particulars will be announced shortly.

The Executive Committee proposes to find for Members of the Congress lodgings in the town, or rooms in one or more of the Colleges at a moderate charge; rooms in College will be available only for men.

The Executive Committee invites an early provisional notice of intention to join the Congress, in order to be able to make the arrangements for the necessary accommodation.

The proceedings of the First Congress are in the press and will be published shortly.

All communications and enquiries should be addressed to the General Secretary of the Executive Committee.

MALCOLM BURR,

C/o. The Entomological Society of London,

11, Chandos Street, Cavendish Sq.,

London, W.

COFFEE DRINKING.

At a recent symposium of the College of Physicians of Philadelphia stories were related of experiments which exploded the theory long believed in medical circles that caffein, the basic stimulant in coffee, is deleterious to health. Whatever ill is caused by intemperate coffee drinking, the physicians concluded, does not result from the caffein therein contained. Experiments conducted both by psychologists were described to prove that caffein stimulates the muscles, the nerves, and the mental organs, without creating a secondary depression common to most stimulants. Physiological experiments were described by Dr. H. C. Wood, jun., to show that caffein did not affect deleteriously the muscular and circulatory systems. On the contrary, said Dr. Wood, caffein made the muscles more active and more work possible.—*Globe.*

TEA.

China Tea.

It would perhaps be interesting, the *Grocer* observes, to look back on the new crop, 1911-12, as far as we have gone, and, if possible, take a peep at the probable course of the market between now and the end of the season. The method of handling tea is altering greatly, owing to our being able to receive samples some two to three weeks after their purchase in China, *viâ* the Siberian Railway, while probable users can make their purchases a good month before the arrival of the bulk without the trade knowing what a competitor is doing. This has been done to a very large extent this season, more especially in the finest grades and common kinds, and the consequence is that when the steamers arrive the offering of their cargoes meets with a quiet reception, and importers are glad to quit their holdings for a commission or nominal small profit, more particularly as much higher prices were paid this season in China.

The northern teas (Monings) have been a fair average crop, and opening prices were reasonable, and buyers have just helped themselves without raising prices with the exception of the first arrivals costing 5½*d.* and 6½*d.* These teas, however, have lately gone up nearly 1*d.* per lb., while all other grades show no improvement. Still, supplies are very moderate, and unless this country gets some Russian or Continental demand prices are likely to remain about the same from 9*d.* upwards. Foochow has sent over a much better crop of Panyongs, Soo Moos and Souchongs, but the trade use very little, and the English market is mainly dependent on the near Continent for the sale of these teas. A fair trade was done in them at the opening, but since then they have remained dormant and the recent buying and excitement in Monings have not raised a ripple on Foochow teas with the exception, perhaps, of siftings, which opened much higher than usual, and have since been turned over at small profits on the market.

The high prices of Indian, Ceylon, and Java leaf this season have had a marked effect on the delivery of China Congou. Since June distributors have been delivering 1½ million pounds Congou per month, or at the rate of 18 million lbs. per annum. Last season we imported 15 million lbs., including some 2 million lbs. from America. This season Great Britain will probably not receive more, although the exports from China to date for the United Kingdom are two or three millions more, as transhipments to America and Germany are much larger, and it cannot be expected that America will help this market this year. Reports state that China is bare, and the rebellion has stopped all chances of raking up any rubbish. The English market is quite bare of common tea, and with very little on the water it is difficult to see how the blenders can supply their wants for the next seven months. By June 30 next, the stock of Congou of all kinds will probably be under three million lbs., and unless the quotations for British grown tea fall considerably, we must anticipate a rising market for all China Congou up to 9*d.* per lb.

American Tea.

The American Government's experiments in tea farming this year were highly satisfactory to the Department of Agriculture officials. On the 100 acres in South Carolina, where the Bureau of Plant Industry is conducting the work, there were produced this year about 12,000 pounds of tea, worth fully $1 a pound.

The increased demand in the Southern States for this American tea has produced a near by market for all of it.

RUBBER.

Notes on the Tapping of Hevea Rubber by the Method of Paring.

Vol. VI., No. 2, October, 1911, of the Circulars and Agricultural Journal of the Royal Botanic Gardens, Ceylon, comprises a paper on the above subject by Mr. R. H. LOCK, M.A., Sc. D., which reads as follows:—

INTRODUCTORY REMARKS.

The following Circular contains for the most parts facts and recommendations of an elementary kind primarily addressed to rubber planters of limited experience. To any one of matured knowledge who happens to read these pages we would point out that in recommending a particular system of paring we do not by any means intend to condemn half-a-dozen other systems, any one of which is probably just as good. In the present state of knowledge it is impossible to say more for one method than that it is probably no worse than several other systems. There are, however, a number of points common to all good systems of paring with which it behoves the young assistant to become acquainted as speedily as possible. It is hoped that the following pages may serve a useful purpose in this connection.

The present Circular is concerned solely with methods of paring. The use of rotating or spur-shaped prickers is now almost universally condemned, for reasons some of which will presently be discussed. Other methods of pricking are under trial at various establishments. Some of these show signs of considerable promise, but experiments have not yet been carried far enough to allow of any definite conclusions being drawn as regards their relative value as compared with paring. The Agricultural Department of Ceylon will doubtless deal with these methods in an exhaustive manner at some future date. In spite of the possibility that ideas as to the best method of extracting latex may undergo a complete revolution in the future, we may in the meantime regard a well-chosen method of paring, if carried out with proper care, as being the safest and most satisfactory system of dealing with a Hevea plantation so far evolved.

THE BOTANY OF RUBBER TAPPING.

We make no apology for introducing here a few elementary botanical facts, a knowledge of which is essential for any one who has charge of a plantation of rubber trees. The remarks now made relate to those parts of the tree which are directly or indirectly affected by the operation of tapping.

The growing organs of a tree consist of leaves, stem and roots. The function of the roots—to take the last-mentioned organs first is, firstly, to hold the tree firmly upright by anchoring it in the soil; and secondly, to absorb certain substances contained in the soil which are essential for the nourishment of the tree. Among the most important of these substances, as is well known to all who are familiar with the application of artificial manures, are certain compounds of nitrogen, phosphorus, and potash.

Before these materials can be made use of as food by the different parts of the plant, it is necessary for them to be altered and combined with the still more important substance, carbon, which is obtained only by the leaves, one of whose functions is to absorb this substance from the air in the form of carbonic acid gas. We may compare the leaves of the tree to so many minute kitchens in which the different ingredients of the tree's food are prepared and compounded into a form in which they can be readily digested and utilized by the roots, stem, and other organs. To carry out this function properly the leaves must be well exposed to air and sunshine.

We now pass to the functions of the stem or trunk of the tree. The first of these is to support the leaves in a position where they are well exposed to air and sunshine, and the second is to conduct the necessary mineral substances from the roots to the leaves, and also to conduct the elaborated food supply downwards from the leaves to the roots.

The trunk of a tree is well known to consist of two main portions—the wood and the bark.* If the bark is stripped from the wood the separation takes place at an extremely soft and delicate layer of tissue known as the cambium. Channels for the conduction of sap occur both in the wood and in the bark, and two entirely different streams of sap are associated with these two regions. An upward current of sap occurs in the outer part of the wood, by means of which current the mineral substances absorbed by the roots are carried to the leaves in a state of very weak solution. The perfected food materials are carried down through definite channels in the inner part of the bark by a stream of sap which is entirely independent of the upward stream. The system of minute vessels which contain the latex or rubber milk are entirely separate from both the above-mentioned sets of channels, and have nothing to do with either of them. The upward and downward streams of sap are found in all trees, but latex occurs only in a few.

We may consider in somewhat closer detail the structure of the bark itself—using this word in the popular sense to include all the tissues which lie outside of the tree. We find, first, a brown or gray layer of cork, which is generally thin in young and untapped trees. Inside the cork is found a thin dark-green layer in healthy trees. Discolouration of this layer indicates that the health of the tree requires attention. Next comes a granular yellowish or pinkish tissue, which makes up the greater thickness of the bark. The granular tissue passes gradually into a very soft white layer which immediately adjoins the wood. These four layers make up the bark. If the bark is stripped from the tree the separation takes place at the cambium, an exceedingly thin layer of tissue, which is destroyed in the process of stripping.

The latex tubes occupy both the soft and granular layers. They are arranged in the form of a series of concentric networks wrapped completely round the tree. The meshes of this network vary in size and are elongated in the vertical direction, the length of a mesh being about five times its breadth. Looked at in surface view, the latex tubes making up the network occupy about the same area as that of the spaces between them. . . . . . The bark of a six-year old tree may contain twelve or more separate networks one inside the other, and each network appears to be continuous over the whole trunk and much of the branch system of the tree. The tubes of the separate networks do not appear to communicate in any way. The tubes making up a particular network, on the other hand, are in full communication with one another, at least in the granular layer—in the soft inner layer they are still partly separated by cross partitions. For this reason it is unprofitable as well as dangerous to tap right down to the soft layer. The tapping cuts should remove nearly, but not quite, all the granular layer. A small amount of this firmer tissue should be left to protect the soft tissue which contains the important conducting vessels for the downward sap current and immediately adjoins the cambium.

The evil results of ringing the bark, *i.e.*, severing it by a cut which penetrates to the cambium and extends right round the tree, are primarily due to the interruption of the downward food supply, which must

* Including the layers known to botanists as the cortex.

ultimately lead to the starvation of the roots and the consequent death of the tree. Such ringing may occur more or less completely as the result of injudicious tapping. Any cut or prick which reaches the cambium must sever a certain number of the channels through which the sap passes down to the roots, and it is highly probable that the weakening effect of excessive tapping is quite as much due to the starvation of the roots as to the removal of the latex. Any system of tapping which involves the cutting or pricking of the whole circumference of the tree at one time is especially bad from this point of view, and it must be considered advisable never to tap more than a third, or at the most one-half, of the total circumference of the tree at any one time.

After a certain interval, tapping may extend to the untapped portion of the circumference. This is owing to the strong recuperative powers of the bark, or rather of the cambium. This important layer consists of a very delicate tissue in which growth and the formation of new and more permanent tissues are constantly going forward. On the outer side of the cambium, and consequently on the inner side of the bark, new additions are constantly being made to the bark itself to replace what is removed by ordinary wear and tear or by the tapping knife. These additions include both new channels for the descent of sap and new vessels for the storage of latex, the two systems being, as we have already pointed out, entirely independent of one another.

The damage caused by tapping too wide an area has been a good deal exaggerated, notably by Dr. Hans Fitting (see review in the "Tropical Agriculturist" for May, 1909). Microscopic examination shows that the functional conducting tubes of the bark are situated very close to the cambium, inside the main layers of latex tubes, so that paring, if carried out with sufficient skill, need scarcely touch the conducting tubes at all. This accounts for the fact that on some estates the spiral system of tapping has been continued for years without any perceptible injury to the trees. Nevertheless human skill is never perfect, and any false cut which just misses the cambium may sever the conducting tubes. This danger is clearly increased when a large part of the circumference is tapped at one and the same time. For this reason the spiral system of tapping is never now recommended to those commencing work on new estates.

The latex tubes being entirely separate from the vessels in which the food-bearing sap is transported, the question naturally arises what is their use to the tree, and what is the precise function of the milky emulsion of rubber which they contain. This is a point as to which we are still very much in the dark. From the fact that the great majority of trees get on perfectly well without any latex at all, we are driven to the conclusion that this substance is not absolutely essential to the life of the plant, and it is certainly the case that large quantities of latex can be removed without causing any visible injury to the health of the tree. On the other hand, the latex is undoubtedly formed at the expense of valuable food material, and the removal of latex must thus indirectly cause a drain upon the supply of food available for the roots and for the purposes of general growth. This drain is additional to that check to the food current which is caused by the partial ringing effect which even the best tapping produces. The amount of tapping which can be safely carried out is therefore limited, though only experience can decide the point at which safety ends and danger begins.

Even the most expert tapping is therefore dangerous if carried to excess. Inexpert tapping is attended with another and more serious danger in the injury to the cambium which it involves. The cambium is such an

important part of the tree that it is very desirable for the planter to have a definite idea as to its nature and functions. Situated as it is between the wood and the bark, the cambium is the seat of growth of both these regions. Injury to the cambium involves the cessation of growth at the spot where the injury occurs, and since only the younger portion of both wood and bark are active in the upward and downward sap-transport already described, any extensive injury to the cambium involves serious damage to the whole economy of the tree, quite apart from the danger that the germs of disease may make their entry at the point of weakness.

Owing to the extreme thinness of the cambium itself, injuries to this tissue involve corresponding damage to the outer part of the wood and to the inner part of the bark. Taking, first, the case of the wood, if the injury to the cambium is not extensive, a renewal of growth soon takes place, and the injured wood becomes buried beneath fresh layers of woody tissue. By cutting into the outer part of the wood the traces of old injuries can often be found. Injuries to the inner part of the bark caused by irregular tapping are often of a more serious nature, especially when fragments of the outer bark or other foreign substances are driven in to the neighbourhood of the cambium through injudicious pricking. In this case there often arises an abnormal growth of woody nodules in the bark itself, as has been fully described by Mr. Petch in a recent Circular (Vol. IV., No. 18). These nodules lead to serious difficulties in the tapping of the renewed bark. Mr. Petch associates this form of injury especially with the use of the blunt pricker, although we are assured that this instrument has frequently been used without the production of any of these nodules.

It is quite certain that nodules are much more frequently formed on tapped than on untapped trees, although they are by no means unknown on trees which have never been touched by any kind of tapping instrument. There seems further to be good evidence that they are most frequent of all in cases where the rotating pricker has been employed. It has been brought to our notice, however, that after pricking one side of the tree nodules frequently make their appearance on the untapped area opposite or below the tapped section. In such cases there are no bark fragments present to act as nuclei for the formation of the nodules, and their appearance can only be regarded as a response on the part of the tree to injury and irritation. It appears, too, that any kind of severe tapping favours the production of nodules, especially during dry weather and at high elevations. Here we find another strong argument in favour of exercising the greatest care and moderation in the extraction of the latex.

The bark is constantly undergoing increase in thickness. When its outer layers are removed by paring, the cambium and young bark remaining are stimulated in a healthy tree to still more rapid growth, and the tapped area undergoes *renewal*. The time required by the bark to renew such a thickness as will allow of a repetition of the paring process varies according to different circumstances. Factors which affect the rate of renewal are the age of the tree, its relative size, strength, and state of nutrition, and any external circumstances, such as climate, soil, elevation, and rainfall, which modify nutrition. Renewal is also affected by the method of tapping adopted, and by the extent to which the tree has been tapped. For although moderate tapping stimulates renewal, excessive tapping hinders this process, and the more heavily a tree is tapped in the first instance, the longer will be the period which must be allowed to elapse before tapping can be repeated. As regards the individuality of the tree itself, the old tree described in Circular No. 20 of Vol. V might have been tapped again over the same area within eighteen months of the first tapping, whereas an ordi-

nary five-year old tree generally requires fully three years for proper renewal. When the renewed bark is tapped again, the second renewal takes longer than the first, unless the tree is exceptionally lightly tapped, and, similarly, the third renewal takes longer than the second in the methods of tapping usually employed. These facts indicate that the strength of the tree is gradually being exhausted, and it seems clear that in order to preserve the health of the trees it will be necessary to tap more moderately, and to allow a longer interval for the first renewal than is generally done at present.

PRACTICAL RUBBER TAPPING.

Experiments carried out at Henaratgoda and elsewhere have shown that the *interval between successive tappings*—so long as this does not exceed a week or so—makes little difference to the yield of rubber per tapping. The interval chosen is therefore mainly a matter of convenience, and the most convenient interval is usually found to be one of two days. Daily tapping carried on continuously—unless the area tapped is very limited—entails using up the bark so rapidly that all the readily accessible bark is stripped from the tree before the sections first tapped have sufficiently renewed to allow of a repetition of the process. This generally means in addition an excessive drain upon the resources of the tree, and in this way the renewal of the bark may actually be hindered. Two days between successive tappings is therefore the interval most commonly allowed.

The time which must be allowed for the *renewal of the bark* differs according to the size and vigour of the tree. But we think that experienced planters would generally agree with the following statement. If the system of tapping is such as to remove the whole of the external cortex to a height of 6 feet, tapping of the renewed bark may be begun after three years on large and vigorous trees, and these may be roughly defined as trees which have reached a girth of 3 feet at 3 feet from the ground at the period in question.

In the case of trees which do not exceed 2 feet in girth after two years' tapping, the rate of removal of the bark should be retarded in order that the renewed bark should not be touched for two years more *i.e.*, four years in all. To treat different trees according to their size would doubtless lead to difficulties in estate work, and under these circumstances we should recommend an interval of four years rather than one of three, except under very favourable conditions.

As regards the size at which tapping may safely be begun, we consider that trees less than five years old from planting should not be tapped at any point where they are less than 18 inches in girth. The reason for this restriction is that the bark is then so thin that it is almost impossible to pare without causing injury to the tree.

If it is decided to allow four years for the renewal of the bark, the simplest system which can be adopted is to divide the circumference of the tree into four equal parts, and to tap these successively by the *half-herring-bone method*. Each quarter section of the tree will then present a years' tapping. The quarter section opposite the first should be tapped second, and the other two in order.

It may be useful to describe in detail a method of marking out such a system on the tree. We will suppose a tree is 20 inches in girth at 4 feet 6 inches from the ground. At this point a horizontal line is stencilled round the tree, and from two points 5 inches apart in this line two vertical lines, A B, C D, are ruled down to the foot of the tree. The tree may perhaps be 24 inches in girth a foot from the ground, and in this canse the lines will be 6 inches apart at the point S. These lines should be so arranged that the equidistant points B, D, F, and H fall between the main lateral roots of the tree, otherwise there may be a difficulty in getting the collecting cups to stand upright.

PLATE 1.

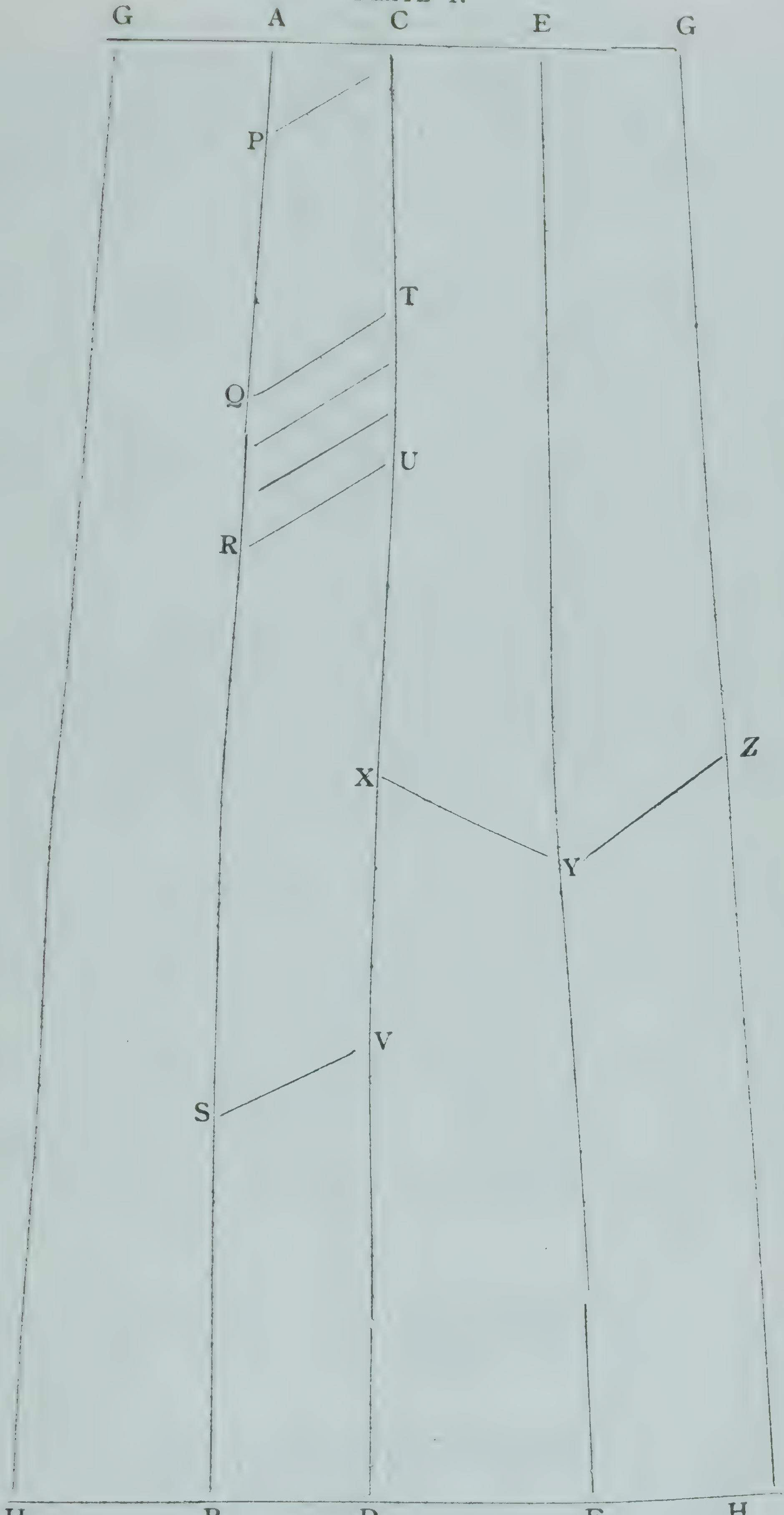

DIAGRAM OF TAPPING.

Next, a mark is made at P, 5 inches below A, so that A P is equal to A C, and a line drawn from P to C will make an angle of 45 degrees with the horizontal. Marks R and S, T, U, and V are made at intervals of a foot below P and C respectively, and the lines are drawn joining up P C, Q T, R U, and S V. These lines represent the positions of the original tapping cuts. The lower lines will make angles of rather less than 45 degrees with the horizon, but not so much so as to make any serious difference in the result of tapping.

This method of marking will be found more accurate than measuring up from the ground, since the ground level on different sides of the tree is liable to vary considerably. The marks are best made boldly with a tapping knife, so as to leave a permanent trace on the surface of the tree.

From P nearly to B a broad shallow cut is made to form the conducting channel for the latex. The line C D should also be marked out with a clear cut, so that the tapper may keep to the limits of the area marked out for him. It will further conduce to accurate work if additional guide lines are stencilled between the original tapping cuts and parallel to these at intervals of 3 inches or so, as shown within the area Q T U R.*

In the case of a smaller tree—one which is less than 20 inches in circumference at a foot from the ground—tapping may be begun upon a basal V as shown at X Y Z. After this V has been tapped for a year, the tree will probably be large enough to allow of placing two or more half-herring-bone cuts upon the opposite side of the tree. In this case the areas A B C D and A G H B would be tapped in succession, followed by a further half-herring-bone on the area C X Y E above one-half of the original V.

When a particular tree is first tapped by the herring-bone or half-herring-bone method, it will be found that the latex flows in nearly equal quantity from each of the series of cuts. As the bark between the different cuts becomes used up, a relatively larger proportion of the total latex flows from the lowest cut, and some of the upper cuts will probably cease to yield latex, whilst, there is still an inch or more of bark remaining untapped. It is probably best in all cases to leave the last inch of bark untapped and to continue tapping in the lowest cut only, if the time has not yet arrived for passing on to a fresh area of bark. When this section of the tree comes to be tapped a second time it may be marked out an inch higher than before, so that the slips of untapped bark are now the first to be tapped.

In an experiment at Henaratgoda 29 trees were tapped daily by the herring-bone method with six cuts placed at vertical intervals of a foot. During the first month's tapping the three upper cuts yielded together a daily average of 558 cc. of latex (nearly a pint), and the three lower cuts a daily average of 561 cc. During the last month, at the end of which the bark between the cuts had been almost entirely removed, the average daily yield from each of the six cuts was as follows:—

1	2	3	4	5	6
77	86	98	82	83	400

Thus, when the bark between the cuts is nearly exhausted the lowest cut yields as much latex as all the other five put together. In addition, the latex from the lowest cut is more concentrated, and contains a higher percentage of rubber.

These were old trees with a good thickness of bark. In the case of young trees we should expect the difference to be even greater.

* On most estates in Ceylon the cuts are made in the opposite direction to those shown in the diagram, *i.e.*, in the direction X Y, and this method is said to give a larger yield than the other.

As regards *tapping tools*, there is a great variety on the market. Many of these are highly efficient, and it is not our business to puff the wares of any particular maker. Our own view is that the simplest tools are the best, and that a great deal is to be said for the original and primitive forms—the gouge and farrier's knife, or slight modifications of these forms. These tools are very widely used in the Malayan plantations, but the Ceylon planter seems generally to prefer a more complicated weapon. The simple tools necessitate greater care on the part of the tapper, but once the requisite skill is acquired, the greater adaptability of the simple tool and the greater ease with which it can be kept thoroughly sharp enable the worker to keep a very straight line and to remove a very thin shaving, preserving at the same time an accurate depth of cut, these three merits being the chief requisites of good tapping.

The necessity for putting in the largest possible number of cuts per inch does not seem to be sufficiently recognized on many Ceylon estates; indeed we have even heard of coarse tapping being encouraged with a view to "getting through" the area of bark marked out for a particular season. No policy could be more mistaken. The removal of the thinnest possible shaving of bark leads to just as free a flow of latex as does a cut an eighth of an inch wide, whilst the all important bark is preserved for future tapping. The amount of rubber obtained is proportional rather to the amount of bark left on the tree than to the amount of bark removed.

Given a sharp and suitable tapping knife, a good workman should put in 20 cuts before removing an inch is of bark measured in the vertical direction, but an average of 18 cuts to the inch probably as much as can be expected. Alternate-day tapping allows for the possibility of 180 tappings in the year, but the actual number of tapping days will probably fall considerably short of this number. Making some allowance for error, we may expect to cover 10 inches of bark in a year by alternate-day tapping. If we place the tapping cuts one foot apart in a vertical direction we shall have 2 inches of bark to spare. This may either be left untapped, or it may be used up by resorting to daily tapping at the season of greatest flow. On the western side of Ceylon this seasonal maximum occurs towards the end of the year, and the greatest advantage may be taken of it if the tapping of a fresh area of bark is begun about the beginning of November. Later on during the droughts of February and March, the tapping should be less vigorously carried on, and may with advantage be stopped entirely so long as the trees are leafless. Tapping during the prolonged drought of 1911 led to damage of the bark on many plantations, whilst yielding scarcely any latex.

Tapping should always be begun at the earliest possible hour of the morning. The latex flows most readily when the tension of sap within the bark is greatest. In plants generally this tension is highest at night, and, except in very wet weather, begins to fall off immediately after daybreak, reaching a minimum during the afternoon.

On very large trees where quarter surfaces are too large to be dealt with conveniently on the half-herring-bone method, the full-herring-bone system may be adopted. This consists simply of two half-herring-bones turned face to face, forming a series of Vs with a common conducting channel.

A few minor hints may be added in conclusion. If the tapping cooly makes a mistake and cuts too deeply, injuring the cambium, he should be instructed to make three or four very shallow cuts immediately below the wound, so as to leave a thick peace of bark, from which renewal can take place. If tapping is continued to the normal depth however carefully—the wound is almost certain to spread.

At the bottom of the conducting channel a tin spout should be fixed into the bark, to throw the latex clear of the bark into a cup placed on the ground below. The practice of pushing the edge of a metal collecting cup into the bark at each day's tapping is not to be encouraged.

In all operations dealing with latex the utmost attention must be paid to the virtue of cleanliness. In the factory the standard of cleanliness should be at least equal to that adopted in an up-to-date dairy. Latex is as easily contaminated as milk, a substance with which it has many properties in common. Here we may seem to be passing beyond the subject of tapping to which this Circular is intended to be strictly limited, but it is necessary to point out that the avoidance of all kinds of dirt must begin from the moment that the latex first makes its appearance on the surface of the tree. Collecting cups, paring knives, and the bark itself should all be kept scrupulously clean. All scrap should be carefully removed from the tree before paring commences, and in order to save the precious hours of the early morning, this may very well be done during the afternoon of the day before tapping.

DESCRIPTION OF FIGURES.

Plate 1.—The diagram is supposed to represent the bark from the lower part of the tree, as it would appear if removed from the trunk by two horizontal cuts at G and H and a single verticla cut between G and H. The bark removed is then spread out quite flat. In its natural position on the tree the points G G are in contact; also H H.

Plate 2.*—Fig A represents the network of latex tubes, as seen in surface view in a section of the inner bark taken in a vertical direction parallel to the surface of the tree (a tangential section). The latex is shaded. Magnification, 50 diameters.

Fig. B.* shows a small portion of a similar section magnified 150 times. The section is taken very close to the cambium, and many of the partition walls which divide up the latex tubes at this stage are still intact; at various points may be seen the remains of other walls which have already broken down. Later on the whole of the shaded area becomes continuous and more or less free from obstructions.

August 10, 1911. R. H. LOCK.

[* These are not reprinted here.]

The coffee crop of his consular district (Tapachula, State of Chiapas, Mexico) for the season 1910-11 is, according to Consul A. W. Brickwood, Jr., estimated to have been 160,000 quintals, equivalent to 16,233,600 pounds, worth $1,982,000. The crop in the Soconusco district exceeded that of the previous year by more than 1,500,000 pounds, but the other districts showed up so poorly, owing mostly to the "northers," that the total figures did not reach those of last season by some 5,000,000 pounds, although the rise in price made the year's yield worth some $600,000 in excess of the 1909-10 yield. The total shipments of coffee from the three producing districts in the State of Chiapas over the Pan-American Railway were 10,994,367 pounds clean and 1,070,883 pounds shell of which the United States took 1,480,207 pounds clean and 180,931 pounds shell. The district of Soconusco provided about four-fifths of the total shipments. In addition to the above there were shipped from the Tapachula district through the port of San Benito 226,721 pounds of clean coffee to the United States and 15,432 pounds to the interior of Mexico.

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Scientific Officer's Papers.

LXXXV.—CASSIA HIRSUTA AS A GREEN DRESSING.

Cassia hirsuta is the 'Choukate' of Coorg, quite a distinct plant from that known as 'Choukate' in Mysore, which is *Cassia Tora*. It is a robust, shrubby plant reaching a height of three or four feet, the whole plant being covered with a dense coating of rough hairs making the texture of the leaf feel like sandpaper. The branches are angled, the leaves large and pinnate with four to six big elliptical-oblong, pointed, leaflets. The yellow flowers are produced in terminal spikes, or racemes. The pods are long, narrow, and hairy, and open when ripe by splitting along their length into two halves.

The plant is very common in Coorg, especially round Sidapur, and I have found it in several places in the Mysore State. In Coorg it has been tried as a green dressing, for which it appeared very suitable because of its thick growth, providing a lot of material for mulch.

I am indebted to Mr. H. M. Mann for a sample of the plant from his estate near Sidapur, where he has been experimenting with it as a green dressing in Coffee for some time. This sample I have submitted to analysis with the result shown below :—

The sun-dried sample consisted of—

Leaves	....	47·2% containing 2·66% of Nitrogen.
Stems	....	52·8% containing 1·96% of Nitrogen.

ANALYSIS OF THE SUN-DRIED SAMPLE, LEAVES AND STEMS.

Moisture	9·60
Organic matter	82·16
Lime (CaO)	1·82
Phosphoric Acid (P_2O_5)	0·31
Potash (K_2O)	1·07
Other soluble Mineral Matter	4·12
Insoluble matter	0·92
	100·00
Containing Nitrogen	2·27%

1,000 lbs. of the sun-dried material as used for mulch are equivalent to :—

378 lbs. of White Castor Poonac, containing Nitrogen 6%, Phosphoric acid 1%, and Potash 1% and 14 lbs. of Sulphate of Potash, containing Potash 60%.

It will be seen, therefore, that this plant, though not so good as some Leguminous green dressings such as *Crotalarias* and *Tephrosias* with 4% of Nitrogen, still is highly manurial. A point in its favour is the large weight of material it supplies; unfortunately no figures are available to show how much this amounts to per acre.

Mr. Mann has kindly supplied me with the following notes on the experiments he has conducted with it :—

"I cut 15 lbs. just when it was full flower, and have sent you stalks, leaves, flowers, and everything just as it was cut about 6 inches from the ground; it dried down to $4\frac{1}{2}$ lbs.

"I have not been able to find any nitrogenous nodules on the roots of the *Cassia hirsuta*, but two planters have told me that they have done so, so perhaps I am at fault. As a nitrogenous plant I do not think the *Cassia hirsuta* is of very much use, and I prefer some of the Crotalarias, but as a green dressing, and mulch when cut, I consider it is the most easily grown, the hardiest, and gives the largest quantity of green mulch, of any kind of cover crops. I planted mine in the early showers, seed broadcasted in March/April, and it went ahead of the weeds, and kept down grass in open patches; it was so thick in an open patch in July/August that I could scarcely walk through it, I think I planted the seed much too thick, and the young plants ought to have been thinned out. I cut a first lopping in August, and got a heavy quantity of mulch, and now in December there is another good growth to be cut, but I am leaving it for seed, until I hear from you whether it is worth growing as a green mulch. Lopping does not seem to hurt the *Cassia hirsuta* in the same way it does the Crotalarias, and it will stand any amount of cutting, neither the butterflies nor other insects attack it. Of course it does not grow very well under heavy shade or thick coffee, but no cover crop will; in thin coffee, and open patches with supplies, it is excellent, and coffee looks nice and green where *Cassia hirsuta* is growing with it."

RUDOLPH D. ANSTEAD, *Planting Expert.*

Experiments in the Extraction of Manihot Glaziovii Latex.

Two experiments of this kind have been made at Kalamu near Boma, in the Lower Congo, with trees, in the first case, growing in a sandy hollow. The results, which were given in the *Bulletin Agricole du Congo Belge*, show that in the first experiment made in the dry season, employing 129 trees, the yield of latex was 12·9 gallons, equivalent to 32·7 lb. of dry rubber; the renewals of the tapping were made during twenty-nine days. It was noticed that, during this trial, the latex was much thicker and richer in rubber than in the one to be described. A circumstance rarely observed in regard to Manihot was noticed, namely a decided increase in the yield of latex after the first four renewals of the tapping; toward the end of the trial a gradual diminution occured in the quantity collected daily. The second trial was made in the dry season, employing 242 trees situated on a plateau possessing a clay soil with pebbles. The tapping, repeated for ten days, gave 27·6 lb. of dry rubber. In the two experiments, the latex was coagulated to form sheet rubber by the employment of 3 per cent. of its volume of 'formol.' The rubber was kept for a quarter of an hour in water at 80 degrees C., then passed through the press and well washed with water. The report of the experts to whom the samples were submitted showed that the rubber had exactly the same appearance as that shown by Hevea rubber from the Far East. It was valued at 2*s*. 5*d*. per lb. with Pará at 5*s*. 10*d*.

Notes and Comments by the Scientific Officer.

144. *Formic Acid as a coagulant for Ceará Latex.*—The following extract appeared in the *Agricultural Bulletin* of the Federated Malay States a short time ago:—

"The use of acetic acid in the F. M. S. and Ceylon in the coagulating of latex is almost universal, there being only a few solitary instances in which sulphuric acid is used. It will, therefore, be interesting news to our readers to learn that it is claimed that the problem of the best and cheapest coagulating agent has been solved by the Fabrik van Chemische Production (Factory of Chemical Products), Schiedam, Holland with its latest preparation of formic acid. It has been urged, so we learn from home, that while formic acid is the cheapest in price of the organic acids it is more powerful in its action than other compounds of the class. The makers claim that they are in a position to offer a grade containing 90 per cent. of free acid, with specific gravity 1·20, 46 parts of which are theoretically equal to 60 of acetic acid ·63 of oxalic acid, 70 of citric acid and 75 of tartaric acid. It is described as an effective and antiseptic coagulating agent, without any harmful effect upon the rubber and preventing agglutination. In view of the extensive use of acetic acid in the Federated Malay States and in Ceylon, interest attaches to the statements that the tests of Spence prove that the rubber obtained by a treatment with formic acid is as good if not better than the product obtained by the use of acetic acid."

Messrs. Matheson & Co. have been experimenting for some time in Coorg with Formic Acid as a coagulant and I am indebted to Mr. G. L. Newbery for the following account of the results he has obtained with it:—

"For the last year or two, I have been using Formic Acid and find that of all the Acids I have tried, and they are many. that with the exception of Sulphuric Acid, (which I discarded as it seemed to me to be dangerous to use), it is the best by far.

"When coagulating small thin sheet or biscuits, I found that a 4% solution of Formic Acid was sufficient, but with a larger and thicker sheet a 6% was necessary and sometimes I have had to use a trifle more in dull, damp weather. I would recommend the 6% solution for general use, using slightly warm water in the dish—not hot on any account. Differences in temperature should be noted in the coagulating room, for it is important in getting good results to have it not less than 80 degrees. I usually have a stock solution of 6 oz. Formic Acid : 100 oz. of water, and of this stock I use 1 oz. per 30 oz. of latex or even a little more. Should the latex not coagulate under the above conditions, it would be better to add more of the stock solution than increase the strength of the stock solution.

"The Rubber coagulated by this process was very highly reported on at Home and, in fact, it was said to be about the best sample sent at that time (1909-10) of Ceará Rubber. Formic Acid is, perhaps a trifle more expensive than Acetic Acid in the long run, but I am sure it would pay best to use it, should any Acid Coagulant be used. The dry Rubber is *very elastic* and *strong* and gives a nice amber colour. Its preservative qualities are too well known for me to say anything more about it.

"In adding the Stock Solution, of course it is necessary to stir it well in the water used in the dish, both before putting in the latex as well as immediately afterwards. A glass rod is best for this. I should be glad if your correspondents would write to you, if they find any failure in Coagulation."

RUDOLPH D. ANSTEAD,
Planting Expert.

THE PLANTER'S LIBRARY.

The Hevea Rubber Tree in Burma.

In Bulletin No. 7 of 1911 published by the Department of Agriculture, Burma, there is an excellent and simply written account of the recognised methods of cultivating Hevea rubber. Whole hearted agreement is felt with the author, Mr. A. M. Sawyer, the Assistant Botanist, Mandalay, in his recommendations as to clearing and the use of cover crops before planting and before weeds have a chance to grow. Thumbnail pruning at a height of 12 feet is advised, but this practice has been found to induce the growth of branches which break off in even a moderate wind tearing away part of the main stem with them.

A good deal of attention has been paid by the author to the subject of catch crops but one very important point in connection with these has been overlooked, and that is that the Catch crop must not be liable to the same diseases as the Rubber. For instance, Cacao heads the list of plants quoted as suitable for catch crops. Now Cacao is liable to attack by Root Disease, (*Hymenochate noxia*), Dieback (*Botryodiplodia theobromae*) and Canker (*Phytopthera Faberi*) all of which also attack Rubber, and according to Petch, "taking all things into consideration, it must be concluded that, from a mycological point of view, Cacao is the worst possible intercrop which could have been chosen to plant among Hevea."

The following extracts are quoted from this excellent Bulletin as being of special interest to South Indian Planters:—

Method of cultivation.—Although the Hevea tree is cultivable under various methods known to Forestry, it is at present most largely grown only under the simplest of these, viz., the Method of Clear-fellings. The great advantage of this method, when it is applied to Hevea cultivation, is the comparatively early age at which the trees attain to tappable size. But it has many serious disadvantages, some of which are mentioned below:—

(*a*) The destruction, by burning, of the organic matter (humus) which is a natural source of valuable plant-food. The benefits of burning the surface of the soil and the accretion to it of the ashes of the forest are small when compared with the loss of the humus and not lasting enough to be of much use to a perennial tree-crop like the Hevea;

(*b*) The exposure of the crop to wind and weather, the direct heat of the sun, the erosive action of the rain,—the evil effects of all of which are made worse by the practice of clean-weeding the surface;

(*c*) The exposure of the crop to direct insolation, to the swaying action of wind on the stems, and to every other natural danger to which a pure crop of even-aged trees is so well known to be ordinarily subject.

In the following description of the clear-fellings method, as it is applied to the cultivation of the Hevea tree, a few simple suggestions are made to mitigate some of the evils mentioned above:—

"The forest covering the land to be planted is felled in the cold weather and burnt when dry. Any saleable timber is worked out in advance or dragged out after the fellings are made. The unburnt and unburnable timber is usually left lying upon the land; but to, as far as possible, guard against the spread of fire and fungoid diseases, it would be safe, particularly if funds be available, labour cheap, or the area small in extent, to fell the

trees by their roots, or to wrench out all stumps, and drag out all timber. (All small unburnt timber should, at the same time, and in any case, be lopped, heaped, and burnt again; so that at the commencement of the rains, the area would be thoroughly cleared and covered only with the ashes of the forest.) To again protect this bared surface, as speedily as possible, from wind and weather, and to thereby minimise, to some extent, the dangers to which it would be otherwise exposed, should be the chief aim of the rubber planter. For this nothing is better than to bring up a dense growth of herbaceous plants, other than weeds, upon the area. Some of the most suitable plants, for protective cover-crops are given in the statement appended to this Bulletin. Any of these crops, at the commencement of the rains, should be shown thickly over the land, preferably, after ploughing and harrowing the surface so as to mix the ashes with the soil. The crop by its quick growth, will soon form a dense covering over the soil, smothering the weeds which would otherwise spring up, letting in moisture but preventing insolation, minimising the scouring action of rain, and protecting the soil from drying winds. When the rains begin, but before sowing the cover-crop, the area to be planted should be aligned and pitted. The pits may be 2 feet long, 2 feet wide, and 2 feet deep, or 3 feet long, 3 feet wide, and 3 feet deep; the larger the pits the better will the plants grow, expenditure in their preparation should not, therefore, be stinted. The soil from the pits being thrown on one side, the pits should be exposed to weather for a fortnight after which they should be refilled by scraping in the best of the surface soil lying around them. The pits measured from centre to centre, may lie from 20 to 30 feet apart. They may be arranged in rows at right-angles to one another or obliquely to form equilateral triangles. When the rows cross one another at right-angles, they would enclose either squares or rectangles between them and the resultant methods of spacing are known, respectively, as the Square or Rectangular; but when the rows enclose equilateral triangles, the method of spacing is known as the Hexagonal.

"The number of plants that can be planted to an acre will depend on the distance at which they are planted. Distance in planting, again, will depend upon the degree of richness of the soil to be stocked and whether catch-crops are to be grown with the rubber or not. On poor soils, as a rule the spacing should be closer than it would be on soils that are rich; but generally speaking, if the soil of a locality be so poor as to be unable to grow large trees and to need the protection of very close planting, it should not be selected for Hevea cultivation. If it be intended to grow catch-crops with the rubber, the distance between the latter must be greater. By close planting is meant planting at any distance of less than 20 feet apart. The chief disadvantages of close planting, even on soils of average fertility, are:—The generally spindly nature of the trees, the relatively smaller yield of rubber per tree and the generally inferior quality of the rubber-milk, the delay in the healing of excised wounds made for the extraction of the rubber-milk, the greater ease with which diseases are transmitted and spread. On the other hand, the advantages of distant planting are:—The early formation of wide-spreading crowns, thick stems, and a thick milky bark; the larger yield of good rubber-milk; readiness in the healing of excised wounds; difficulty in the dissemination of disease. The chief object which is to be aimed at in the cultivation of Hevea is the production, within a reasonable time from planting them, of trees with thick-barked stems of medium height, large girth, and spreading crowns,—conditions of growth which can only arise when the trees are planted far apart. Accordingly it would not be advisable to plant them out at less than 20 feet apart, and, if possible, even

farther apart. Under the method of spacing by the Square Method, a distance of 20 feet apart would give about 108 trees per acre; under the Rectangular Method there would be, when planted 30 feet by 20 feet apart, only about 72 trees per acre; under the Hexagonal Method there would be, when planted 20 feet apart, about 112 trees per acre. These spacings are recommended. The Hexagonal Method, though somewhat difficult to follow in the laying out of an estate, particularly on hilly ground, is economically better than either of the others because it utilises the area available for planting to its fullest possible extent, its great advantage consisting in the allotment of equal-growing-spaces to the plants. It is, however, inconvenient to adopt it when the spacing is small and catch-crops are grown."

"*Sowing in Nursery Beds.*—If the area to be planted out be large and it be intended to stock it with seedlings or stumps, the seed should be shown in nursery-beds. The nursery should be prepared in an open spot, close to water, and, preferably on a part of the area to be planted. If a stream or other natural source of fresh water be not existent at the spot, a good well should be sunk in or near it. On selecting the spot, the land should be cleared and ploughed, all roots, stumps, and stones removed and the soil, after being harrowed and manured, levelled and formed into nursery-beds. The most suitable manures are leafmould and cattle-dung, either of which, with a sprinkling of lime, would, if added to the soil, help to produce strong and, healthy plants. The beds may be 16 to 20 feet long. about 40 inches wide and 4 to 6 inches high. Their tops should be flat and their sides and ends sloped. Drains, about 12 inches wide at the base, should separate the beds from one another. The bases of the drains should be well beaten down to prevent any undue wastage of water.

"The seeds should be sown as in "Sowing at stake." If a bed be 39 inches wide, with an unsown margin of 6 inches on each side, it would hold 4 rows of seeds 9 inches apart. The beds should be watered either by hand with a watering-can or by filling the drains between them from a water-channel. (The water from the drains would enter the beds by soaking in through their sides and ends. The frequency of watering and the quantity of water will depend on the state of the air and soil; but, generally, after the first watering when the seed is sown, water need be given only once or twice a week. The waterings must, however, be copious and thorough.) Good seed should sprout in a week from sowing it. If sown in September-October, the seedlings would be from eight to nine months old at the time of transplanting. To provide against failures in the nursery and plantation, it is safe to sow at least three times as many seeds as the number of plants which will be required for planting out, *e.g.*, if the area be large enough to require 100 plants for one complete stocking, at least 300 good seeds should be sown in the nursery."

Sowing in Bamboo Baskets or Bamboo tubes.—Sowing in bamboo baskets or tubes is, though more expensive than sowing in beds, a safer and, generally, surer method. Its use is, however, indicated chiefly when the planting material is prepared at a distance from the area which is to be planted out, and when that area is small in extent. The great advantages of the method are :—

(*a*) Perfect safety in the handling of the plants;
(*b*) Minimum disturbance to the roots in transplanting;
(*c*) Ease of protection of the plants, if necessary, from insects, diseases, or unfavourable weather.

"The baskets should be made from the soft inner part of the bamboo lying between the thick hard joints. They should be about 20 inches deep,

6 inches across at the top, and gradually taper to a flat base of at least 3 inches in diameter at the bottom. The baskets should be filled with well pressed down soil and placed, side by side, three or four rows deep, on strong wooden benches, platforms of brick, or other hard surface which is raised high enough to be beyond the reach of white ants. They may be placed in the open or under a tree, but too much shade should not be given. At least two seeds should be sown to a basket but only one plant be ultimately left. The baskets should be carefully watered by hand.

"Bamboo tubes are made by sawing off sections of the bamboo so as to leave a joint to each section to serve for a base. They are best when prepared from large thin walled bamboos which are common in the neighbourhood of rivers and streams, evergreen forests and other cool places. The sections should be at least 20 inches deep and 6 inches in diameter. The bases, of course, must be sawn across straight so that the tubes can stand up erect; otherwise the planters are likely to grow crooked. One or a few holes should be bored through the bases to let the soil in the tubes remain thoroughly well drained. The tubes are sown, watered, and otherwise treated as if they were bamboo baskets themselves.

"*Cultural and maintenance operations.*—These are works which are undertaken to produce an improved growth and vigour in the crop and to keep it in continued health throughout. Besides the protection afforded by the crops the soil is improved by occasionally cutting these and either letting the cuttings lie on the surface or burying them under by means of the hoe. But, in any case, long before the sudden excessive light let into the soil by the removal of the cover-crop causes weeds to grow up in its place, a fresh-cover-crop or a temporary catch-crop should be sown on the land.

"*Mulching and Manuring.*—Mulching or covering the surface of the soil with easily-decaying non-poisonous leaves (e.g., *Kathit*-Erythrina, spp; *mezalee*-Cassia Siamea; *Kokko*-Albizzia, spp) is useful during very dry weather. Or, the leaves may be buried in shallow circular trenches around the roots of the rubber plants. As a rule, the roots of the Hevea plant grow out at the rate of a foot in radius from the stem each year, *e.g.*, one foot in the first year, two feet in the second, and so on; so that, it would be safe in preparing trenches for manuring to make them just outside these limits, year by year. The depth of the trench need not be more than 9 inches and its width about as much as the depth. The leaves, which may be fresh or dry, should be well pressed or stamped down in the trenches and carefully covered over with soil. Other manures suitable for Hevea rubber are oil-cakes and old farmyard-manure. Manures should be applied about once a year, preferably towards the end of the rains. As a general rule, it may be stated that manures should not be applied to a crop unless their use is clearly indicated. It is only when the general health and condition of the crop are seen to be flagging that manures need be actually given, and even then only in sparing quantities. If, as has been suggested above, fertile land covered with virgin forest be selected for the rubber plantation, manuring may be wholly dispensed with."

"*Protection from wind.*—If there be danger from wind, the plants should be kept continuously staked until their stems become woody enough to withstand the wind. To be quite effective the stakes should be strong and be driven down close alongside the plants on the side from which the wind usually blows. If, however, the wind be very strong, long and continuous belts of forest, from 30 to 50 feet wide, should be preserved at intervals on the land, at right angels to the direction of the wind.

DISTRICT PLANTERS' ASSOCIATIONS.

Malabar Coast Planters' Association.

Proceedings of a Quarterly General Meeting held at the Trichur Club on December 2nd, 1911, at 4-30 p.m.

PRESENT.—Messrs. A. H. Mead (Chairman), H. C. Plowden, W. D. Tait, W. A. Fleury, Eric Norman, and R. de Roos Norman (Honorary Secretary). Mr. Mead in the Chair.

19. THE NOTICE calling the meeting was read.

20. PROCEEDINGS of the last meeting were confirmed.

21. ACCOUNTS.—Read Auditor's report.

22. DELEGATE'S REPORT.—Read report of Mr. H. C. Plowden, the delegate to the U. P. A. S. I. meeting, Bangalore. Resolved that Mr. Plowden be thanked.

23. READ LETTER from the Secretary, U. P. A. S. I., dated 9th September *re* the question of the new official year's finances. Resolved that the same be deferred until the next meeting, as the members present only represent three Estates, and that the Honorary Secretary be requested to write to members requesting their attendance at the next meeting.

24. SECTIONAL MEETINGS.—Read letters thereon.—Recorded.

25. READ LETTER No. 63/11 *re* Mr. Anstead's services on the Committee appointed to consider measures to guard against the introduction of pests, etc.—Recorded.

26. SCIENTIFIC OFFICER'S FUND.—Resolved that discussion on this be reserved until the next meeting.

27. READ LETTER from the Dewan of Travancore *re* detention of account books by Law Courts. Recorded, and resolved that the Dewan be thanked.

28. INDIA CURRENCY.—Proposed by Mr. Plowden, and seconded by Mr. Tait, that this be left over for discussion until the next meeting.

29. RECRUITING AND EMIGRATION.—Read the advertisement drawn up by Mr. Martin and the Circular letter accompanying it. Resolved that this should be brought up at the next meeting for discussion. Read Mr. Plowden's letter thereon.—Recorded.

30. S. I. P. B. F. AND L. A. N. I. FUNDS.—Resolved that discussion on the above be deferred until the next Meeting.

31. TRICHUR EXHIBITION.—Resolved that the Honorary Secretary do circularise members, and request them to be so good as to assist by arranging to send as many exhibits as they can collect and also by making the objects of the Exhibition known to ryots and artizans.

32. RESOLVED.—That a vote of thanks be conveyed to the Honorary Secretary, and Committee of the Trichur Club, for their kindness in allowing the Association to hold their meeting in the Club.

PAPERS LAID ON THE TABLE :—

U. P. A. S. I. Circulars.
Prospectus of the forthcoming Agricultural and Industrial Exhibition and Cattle Show, Cochin State, 1912.
Account Books and Files.
The Indian Currency.
Report on the Administration of Cochin for 1911.

With a vote of thanks to the Chair the meeting terminated.

(Signed) A. H. MEAD, *Chairman.*
(„) R. DE ROOS NORMAN, *Hon. Secy.*

COFFEE.

Blight-Resistant Coffees.

Since the advent of the coffee blight (*Hemileia vastatrix*) into the Philippines some twenty-five or thirty years ago, it has been practically impossible to raise even a fair crop of coffee below 2,000 feet elevation. This blight destroyed the coffee industry not only in the Philippines but in Java, Ceylon, and the Malay Peninsula at about the same time that it reached this Archipelago.

An attempt is being made now by several of the old coffee countries to discover or create one or more varieties of coffee which will be resistant to this fungus, and it is believed there is some hope in some of the new hybrids of robusta coffee (*Coffea robusta*). This Bureau now has growing at the Lamao experiment station a considerable quantity of this coffee, and a little later seed will be distributed to any one who wishes to experiment with this variety. However, like several of the non-commercial coffees this robusta does not have a first-class flavor though it is in some respects better than that of either Liberian (*C. liberica*) or the Inhambane coffee of Mozambique. Another trouble with the new coffees is that they are for the most part very weak in caffein, the active principle of the beverage—some of them possessing no stimulating qualities whatever.—*Philippine Agricultural Review.*

Coffee in Hamburg.

Writing on November 22, 1911, the Hamburg correspondent of the *Economist* reported :—

Coffee has been a quiet, rather heavy market on the whole, with more moderate fluctuations, and an improvement of 1 pf. on Friday subsequently converted by slow stages into a loss on balance of ¼ pf. to ½ pf. The market had a tired appearance. Brazil news indicated that the receipts and accumulating stocks out there were detaching various units from the solid combine, who promised the world to lift prices to higher and higher records. Cost and freight offers came cheaper without breaking sufficiently to permit profitable importing business. Good average Santos is now available below 70s. c. and f. against 73*s.* 6*d.* on 1st inst., when futures here were quoted exactly the same as to-day. It is assumed that those who have controlled the markets of the world so long are afraid to let prices break away in Europe or New York, and this would seem to be confirmed by positive reports that Santos was buying futures here, at Havre, and at New York. Receipts at Rio and Santos together, so far this month are within a fraction of the 900,000 bags which were cabled as maximum pointers at the beginning of the month. Santos receipts now exceed seven million bags since July 1st, and the very low crop estimates put forward a month or two ago have to be modified. Consumption is as indifferent to Brazilian Coffee as at any time this year. The talk is still that the December liquidation will bring surprises, and that elaborate preparations have been made for punishing any operators venturesome enough to have left bear contracts open. But it is asserted that such unprotected engagements must be quite a negligible quantity. To sum up the situation, it would appear that the bull clique or cliques find their burden growing heavy; that the Santos crop will turn out nearer 11 million than nine million bags, and that any further success in pushing up prices will probably prove short-lived.

PLANTERS' LABOUR ACT, 1903.

The Government of Madras have authorized Mr. Gathorne Carson Parker, of Sentinel Rock Estate, and Mr. Bertram Darkin, of Meppadi Nedimballi Estate, Wynaad, to witness the execution of labour contracts.

RUBBER.

Rubber with Intercrops.

The phenomenal rise in the price of tea, coffee, sugar and other tropical products which can, where Hevea trees are properly distanced, be grown as an intercrop, has led many planters and directors to seriously re-consider their planting policies. The unexpected rise in coffee, in particular, has had a great influence, and the fact that this product has already given such handsome returns in Java, is causing many planters to view the possibilities with intercrops in a new light.

In most instances intercrops are not planted until long after all the Hevea trees have been established, but in some cases the Hevea trees have been planted among tea, coffee, etc. In the latter case there has been considerable disappointment, the Hevea growing at such a slow rate owing to the soil having been impoverished for many years with the intercrop. Where the former method has been adopted on virgin land, encouraging results have been obtained. It will therefore be of interest to consider what is being done in various countries now renowed for the position they occupy in connection with Hevea plantations.

Intercrops in Ceylon and South India.

There are about 240,000 acres over which Hevea trees are planted in Ceylon; about 130,000 acres are Hevea alone, the rest—over 100,000 acres—being through cacao and tea and various minor products. Tea is met with as an intercrop in Ceylon at all attitudes between sea-level and 3,000 feet; the greater part of the acreage associated with Hevea, however, is below 1,500 feet. In many cases—and this applies in the main to cacao as well—the Hevea trees has been planted long after tea, the result being a very slow rate of growth and a large number of vacancies, the latter especially on cacao estates. Where the Hevea has been planted at or about the same time as the tea or cacoa, the rubber trees thrive more rapidly. The areas composed of cacao with Hevea in Ceylon are mainly on estates between 750 and 1,800 feet above sea-level, the Matale and Kandy districts being well represented in this respect. The distance adopted in Ceylon is not one which can be recommended for richer soils, and even in that island such of the tea will have to be abandoned at an early date where the Hevea is planted closer than 20 by 15 feet. The cacao plantations will last considerably longer, owing to the advantages accruing to the cacao bushes when grown under the shade of forest trees. In the low country districts of Ceylon, citronella, sugar, tapioca, and other minor products are often grown as catch crops, but these do not cover very large acreages.

Intercrops on rubber estates in South India are met with mainly at high altitudes. Cacao is not grown as an intercrop. Tea and coffee—Arabian and Liberian—are the principal intercrops there.

Intercrops in Sumatra.

Permanent intercrops are not numerous in Sumatra. Tea is not cultivated in that island, neither is cacao to any extent. We believe that the former is about to be tried, and the latter is practically limited to about 30,000 trees under Hevea on Tamiang estate. The principal intercrop is coffee, Liberian being the most popular variety. The only shade given to the coffee is that of the Hevea tree, and this may to some extent, account for the comparative failure of Robusta coffee in that island. The principal catchcrop in Sumatra is tobacco; this could be used much more than at present if a wide distance was permitted for the Hevea trees. The tobacco would be ruined by the drip from the trees if the two products were too near each other.

INTERCROPS IN MALAYA.

Intercrops are not cultivated very largely in Malaya; in fact, they find least favour in that area. Only about 6 per cent. of Hevea is interplanted in the F. M. S., and 13 per cent. in the Straits Settlements. Coffee as intercrop is gradually disappearing on account of the rapid growth of the Hevea trees; this can also be said of other intercrops, particularly in the F. M. S. The following statistics (Report of the Director of Agriculture, F. M. S., 1910) show the interplanted acreages throughout the Peninsula :—

	Federated Malay States.	Straits Settlements.	Johor.	Kelantan and Kedah.	Total.
Rubber alone ...	231,797	50,928	38,222	12,011	332,958
Rubber and Coffee ...	5,236	...	...	...	5,236
Rubber and coconuts ...	4,106	10,000	2	350	5,458
Rubber and Sugar ...	820	676	...	...	1,496
Rubber with other crops ...	3,815	7,964	5,292	634	17,705
Total...	245,774	60,568	43,516	12,995	362,853

INTERCROPS IN JAVA.

It is in the island of Java one meets with mixed cultivation on a large scale. There it is not uncommon to find on the same estate in addition to Hevea, coffee (Arabian, Liberian, and Robusta), Cacao, Coca, Pepper, and Indigo, as intercrops, and also trees of cinchona, nutmeg, kapok (Eriodendron), Ceará, Castilloa and Ficus rubber. . . . On the better estates it is customary to grow only one, or at the most, two intercrops under the Hevea, coffee and cacao being the favoured products for the purpose. Citronella, sugar, indigo, Indian corn, beans, and tapioca are also grown on several estates as catchcrops.

EFFECT OF RUBBER ON OTHER CULTIVATIONS.

On many estates the effect of rubber cultivation on the intercrops is already apparent, especially where the Hevea is closely planted. Sooner or later the Hevea tree alone must be in possession of the land. As in the low country tea lands of Ceylon and the sugar estates of Perak, the closely-planted Hevea trees with increased age demand more soil, and prevent the intercrops from receiving the light they require. In Sumatra and Java the old coffee estates interplanted with rubber will soon be transformed into purely Hevea propositions, and unless new lands are planted, much of the machinery used in the preparation of coffee will be useless. In Sumatra districts like Serdang and Langkat the change will be great, owing to the very large acreage now under Liberia coffee. In five years time the appearance of these two Residences will be considerably changed, and for the first time a forest cultivation will reign. This can, in future, be avoided by adopting a wider distance in planting the Hevea trees.

Brazilian Rubber.

Our Rio correspondent writes (on October 31st):—At the time when coffee was at its lowest, and its production became almost unremunerative, rubber, the second of Brazil's staple products, was obtaining such good prices as practically to preserve the balance of trade. As soon as coffee began to recover, the demand for rubber commenced to slacken, and prices crumbled steadily away, until, just about a year ago, they were little more than a third of the top values touched in the boom. This heavy decline naturally caused a pronounced depression in the Northern markets, which continues at the present time. The Banco do Brazil, at the instance of the Federal Government, has done everything in its power to help traders to tide

over the situation, and especially to avoid their having to make forced sale of rubber at ruinous prices, by making large advances against the stocks held at the shipping ports. In the meantime, these stocks had accumulated at Pará and Manaos, and the merchants were hoping that a favourable change would take place in the situation during the slack season which would enable them to unload at better prices. Unfortunately, the slack season is now practically over, prices have not improved, and the new crop entries, which should commence next month, will further increase the unshipped stocks and thus tend to depreciate values still more. At the beginning of this month the stocks in Manaos amounted to 450 tons, and in Pará to 3,116, or a total of 3,566 tons for the Amazon district. Merchants cannot make up their minds to sell their holdings at the current low rates after the splendid prices ruling a year ago, and with money consequently scarce, both export and import business in the Amazon valley is at a very low ebb. Various conferences have taken place amongst the trading community, which have been attended by representatives of both the Federal and State Governments, but no practical solution of the crisis seems to have been reached. Production in the Amazon continues stationary, at about 38,000 tons per annum, while the next season's crop in the Far East is expected to yield quite 33 per cent. of the total Brazilian out-put. Considering that the world's production at present is over 80,000 tons per annum, it is evident that Brazil is rapidly losing her predominent position in the rubber market and in the course of a few years, instead of supplying 75 per cent. of the world's production,as was the case a short while ago, she will appear with barely 35 per cent. The position will be all the more unfavourable on account of the enormous difference in the cost of production, which coupled with the rapid increase in the quantity gathered in other countries, will no doubt tend to keep prices at a much lower level than will be appreciated out here. For reasons which are obvious, the r ubber problem is of far more importance than the valorisation of coffee, and it behoves the Government to study the question very seriously and without delay. In the case of coffee, Brazil supplies 75 per cent. of the world's output, and it may therefore be relatively easy for the Government to limit production, but with Brazilian, rubber now representing less than 50 per cent. of the total quantity produced throughout the world the question is altogether different. The only practical solution would seem the immediate adoption of measures to facilitate cheaper gathering and more economical transport in the Amazon districts as unless the rubber can be placed on consuming markets at a lower cost, it will have very hard times to go through on account of the competition of other countries.—*Economist.*

In Southern Nigeria.

The following information is taken from the Annual Report on Southern Nigeria (*Colonial Office, Annual Series, No. 695*).

An important stage in the development and improvement of the preparation of native rubber was reached during the course of 1910. Several thousands of trees in the native communal plantations of *Funtumia elastica* having attained tappable dimensions were tapped, and the rubber prepared under the supervision of and by members of the Forest Department, in the presence of the owners. The coagulation of the latex was obtained by boiling, and the coagulant was then rolled out into thin biscuits on a table by a wooden roller, the rubber being washed throughout the operation with very hot water. The biscuits were then hung up to dry and smoked in a long drying shed. Rubber of the first quality was thus prepared by means of simple appliances that can easily be procured by the natives.

The fine clear, amber-coloured biscuits thus prepared were eventually sold in the United Kingdom for 6*s*. 6*d*. per lb., on a falling market when the best Pará only realised 6*d*. a pound more. This is a very great improvement on the usual quality of rubber exported from Southern Nigeria.

As regards the yield, in all 1,022 lbs. of dry rubber were obtained from 4,706 trees over 18 ins., in girth, and from 28,815 small plants that were thinned out and tapped to death. The average returns per tree from the two classes were 1·402 and 0·337 ozs. respectively. The percentage of loss in weight by evaporation of moisture was 37·7 per cent.

Prevention of Tackiness.

Mr. H. E. Potts, M. Sc., contributes the following paper, under the head of "Current Research," to the *Rubber World* :—

Among the exhibits at the Rubber Exhibition were to be seen a number of long glass tubers, filled with various gases, containing small pieces of rubber. The object was to demonstrate that exposure to certain gases caused tackiness. In the recent paper in the "Zeitschrift für Kolloide" the subject is discussed more fully by Dr. E. Fickendey, of Victoria (Cameroons). He describes the experiment which has been just mentioned. It was performed by taking pieces of the same raw rubber, placing them in glass tubes, and filling the tubes with air, oxygen, carbon dioxide, and nitrogen. The tubes were then sealed and exposed to sunlight for some weeks. While the rubber in the carbon dioxide and nitrogen was unchanged, that in the air and still more that in the oxygen, had become tacky, it was found on opening the tube that oxygen had been actually taken up by the rubber, since when the point of the tube was broken under water, this partially filled the tube. Further in these cases the rubber had increased in weight.

These results in contradiction to some opinions which have been hitherto expressed, clearly point to oxidation as at all events one cause, or accompaniment, of tackiness. This conclusion was strengthened by other experiments. Thus rubber which was kept in sunlight under hydrogen peroxide became tacky, but rubber kept in sunlight under water did not. The action of the water would appear to consist in exclusion of oxygen from the interior of the rubber. In fact it is generally considered that moisture inhibits tackiness, though hitherto other explanations have been given. It is interesting that sunlight exerted a very powerful action, although this was known before to a certain extent. Fickendey considers that these and other experiments show that tackiness and oxidation are very closely connected, although he does not deny that there may be other causes.

The remedy which he proposes is ingenious. He suggests that a substance should be incorporated with the rubber which is oxidised more readily, and which will thus exert a protective action on the rubber. The principle recalls the device which has been used to protect metals from being attacked by sea water, when a mass of zinc is attached to the metal it is desired to protect. The zinc is attacked first. In the same way if a readily oxidisable substance is present in rubber, it will tend to prevent oxidation, and therefore according to his experiments, will inhibit tackiness.

The substance whose use he proposes is tannin. A certain amount is added to the latex, not sufficient to effect coagulation. Acetic acid or other suitable coagulant is then added, and the tannin is thus incorporated. On oxidation, rubber thus prepared turns brown, but Fickendey claims that this disadvantage will not be important as weighing against the fact that rubber prepared in this manner did not become tacky on exposure to air and sunlight, while a piece of rubber prepared without tannin showed pronounced tackiness.

OFFICIAL PAPERS.

Standardization of Weights and Measures.

The Government of Madras forwarded to the Government of India the resolution of the United Planters' Association of Southern India urging the standardization of weights and requested the Board of Revenue to arrange for the departmental sale of standard weights.

The Board, in Proceedings (R. S., Sur., L. Rds. and Agri.), No. 284, dated 3rd August 1911, stated :—

The Board begs to submit to Government the report called for in the Government Order read at the head of these proceedings regarding the standard maund and its sub-multiples.

2. The table appended to these Proceedings shows the districts in which the standard maund and its sub-multiples are now in use and those in which they are not in use. The Government observe that the list of districts in paragraph 2 of Board's Proceedings, Mis. No. 930, dated 15th March 1911, differs in some respects from the table in paragraph 20 of Board's Proceedings, No. 654-A, dated 26th September 1892. The districts mentioned in paragraph 2 of Board's Proceedings, Mis. No. 930, dated 15th March 1911, are—

(1) Guntur	(8) Parts of Coimbatore
(2) Parts of Kurnool	(9) Parts of Malabar
(3) Bellary	(10) South Canara
(4) Anantapur	(11) Tinnevelly
(5) The Nilgiris	(12) Portions of Tanjore
(6) Parts of South Arcot	(13) Portions of Vizagapatam
(7) Parts of Madura	

Of these, the names of (2), (7), (8), (12), (13) "parts of Kistna" appear in the column headed "Tract" in the table appended to paragraph 20 of Board's Proceedings, No. 654-A, dated 26th September 1892. "Parts of Kistna" was not included in the list in paragraph 2 of Board's Proceedings, Mis. No. 930, dated 15th March 1911, as the report from Collector of Kistna had not, as stated in paragraph 4 of Board's Proceedings, Mis. No. 930, dated 15th March 1911, been received at the time of its issue. The name of (1) was included in the aforesaid list as Guntur had not been constituted a separate district in 1892 and as the report of the Collector, dated 19th December 1910, showed that standard weights are now in use in all the taluks thereof. The names of (3), (4) and (5) were entered in the list with reference to the entries in the column of remarks in the table in paragraph 20 of Board's Proceedings No. 655—A, dated 26th September 1892, against Kurnool and the Nilgiris. The name of (6) was entered in the list with reference to the entry in the column of remarks against Coimbatore and to the statement in paragraph 16 of Board's Proceedings No. 654, dated 26th September 1892. The names of (9) and (10) were entered with reference to the remarks in the concluding portion of paragraph 20 of the Board's Proceedings referred to above. The name of (11) appears in the "N.B." at the foot of the table referred to above.

3. It will thus be observed that the list in Board's Proceedings, Mis. No. 930, dated 15th March 1911, tallies with the entries in Board's Proceedings, No. 654—A, dated 26th September 1892, except in regard to "Parts of Kistna." The Board, further, begs to state that the list of districts in paragraph 2 of Board's Proceedings, Mis. No. 930, dated 15th March 1911, is the same as the list appended to paragraph 15 of G. O., No. 210 Revenue, dated 4th March 1893, except "Portions of Tanjore" which seems to have been omitted, by oversight, from the latter.

4. With reference to the report called for in clauses (2) and (3) of paragraph 2 of the Government Order read at the head of these Proceedings, the Board begs to state that the orders conveyed in G.O., No. 210, Revenue, dated 4th March 1893, were not regarded as final as the Board apparently belived that as regards weights as well as measures, supplementary orders would be issued after correspondence with the Government of India. No direct steps were, therefore, taken to popularize the standard maund and its sub-multiples. From the reports received from Collectors, it appears that, in many, if not all, districts in which weights other than the standard weights are in use, local weights are being stamped.

5. The attention of the Collectors of all districts is invited to the instructions ot Government contained in paragraph 3 of the Government Order read at the head of these Proceedings and they are requested to instruct the stamping establishments in their districts that, hereafter, only the standard maund and its sub-multiples should be stamped.

6. The Government observe that the departmental sale of weights is recommended by the Board in certain districts in which the standard weights are in use while it is not recommended in some other districts in which they are not in use. The departmental sale of weights was not recommended by the Board in Madras City, South Canara and Malabar although the standard weights were not in use there for the following reasons. In Madras, the Collector considered that private merchants could easily undertake to supply the standard weights. As regards South Canara, the Collector remarked that the people would not adopt the 960 tola maund voluntarily because the local maund and the Bombay maund coincide and much trade is done with Bombay and that it was therefore hardly worth while to attempt to sell the standard maund departmentaly. As regards Malabar, the Board directed in B. P., Mis. No. 3136, dated 31st August 1910, that the introduction of the standard maund and its sub-multiples into Malabar should be postponed but the Board, as now constituted, considers that an effort may be made to introduce the standard maund in this district also. In regard to the recommendation to sell standard weights departmentally in certain districts in which they are now in use, the Board submits that this recommendation was made as the Collectors recommended such sale and as, in the opinion of the Board, the adoption of that course might tend to encourage the use of standard weights. In Guntur, Nellore, North Arcot, Chittoor, Trichinopoly and Tanjore where standard weights are in use to a greater or less extent the Collectors did not recommend local sale and the Board accordingly abstained from recommending it.

7. The Collectors of the marginally-noted districts are requested to arrange for the manufacture and sale of the standard maund and its sub-multiples as specified below and to apply for the requisite advances under article 137 (*a*) of the Civil Account Code:—

Vizagapatam	Coimbatore
Kurnool	Madura
Bellary	Ramnad
Anantapur	Tinnevelly
North Arcot	The Nilgiris
South Arcot	

1 palam	3 tolas,
8 palams	1 seer.
5 seers	1 viss.
8 visses	1 standard maund.

8. One of the suggestions made by the Board in 1892 was that the standards of weights and measures should be included in the lists of subjects taught in schools and brought up for examination in the lower standards so as to make them familiar to children. The Board is now aware whether any definite orders have been issued on the subject.

APPENDIX.

Districts and taluks in which the standard maund and its sub-multiples are now in use.	District and taluks in which the standard maund and its sub-multiples are not in use.
Ganjam	Vizagapatam (except three taluks.)
Vizagapatam, Vizianagram and Bimlipatam taluks of Vizagapatam district.	Pattikonda taluk of Kurnool.
Godavari.	Bellary.
Kristna.	Anantapur (except Kadiri.)
Guntur.	Madras.
All taluks of Kurnool except Pattikonda.	Villupuram and Cuddalore taluks of South Arcot.
Kadiri taluk of Anantapur.	Tiruvannamalai taluk of North Arcot.
Cuddapah.	Coimbatore (except Bhavani.)
Nellore.	Palni and Periyakulam taluks of Madura.
Chingleput.	Ramnad except two divisions.
All taluks of South Arcot except Villupuram and Cuddalore.	Tinnevelly.
Chittoor.	Malabar.
North Arcot except Tiruvannamalai.	South Canara.
Salem.	The Nilgiris.
Bhavani taluk of Coimbatore.	
Trichinopoly.	
Tanjore.	
Madura (except Palni and Periyakulam.)	
Ramnad and Devakottai divisions of Ramnad.	

Government Order No. 3294, Revenue, dated 4th November 1911, reads:—

Recorded.—

2. The Government approve the action of the Board of Revenue in directing the discontinuance of the stamping of weights other than the standard weights. They also approve the Board's proposal to introduce the standard weights into Malabar and its instruction in paragraph 7 of the Proceedings read above, to arrange for the departmental manufacture and sale of standard weights in those districts in which this has not hitherto been done.

3. The Board of Revenue is requested to arrange for the departmental sale of standard weights in Madras.

4. With reference to paragraph 8 of its Proceedings, it is observed that in the scheme of Studies for elementary schools for boys provision is made for instruction in Local, Madras and Indian Imperial weights and measures of length and capacity. The Government do not therefore consider that any further action is called for in this respect.

(TRUE EXTRACT.)

(Signed) A. G. CARDEW,
Secretary to Government.

NEW YORK RUBBER EXPOSITION.

Under date London, 6th December, 1911, Mr. A. Staines Manders, Organising Manager of the International Rubber and Allied Trades Exposition to be held next year at New York, writes:—

"In further reference to my letter concerning the coming New York Rubber Exhibition, I beg to say that it has been decided, in order to enable the press, public, travellers and possible investors, to obtain as much information as they can about the resources of the different countries in which rubber is produced, to encourage Planters, if they so wish, to exhibit other products besides the rubber.

"It will be advisable to have full information prepared in booklet form, for distribution to visitors."

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TO THE SIXTH VOLUME OF THE PLANTERS' CHRONICLE.